CAREER & TECHNOLOGY STUDIES

MECHANICS

GUIDE TO STANDARDS AND IMPLEMENTATION

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This document was prepared for:

Administrators	✓
Counsellors	✓
General Audience	
Parents	
Students	
Teachers	✓

Program/Level: Career and Technology Studies/Seconda

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SUMMARY OF CHANGES

This June 1996 version of the *Guide to Standards and Implementation* differs from the June 1995 version as follows:

Section A	No change
Section B	Updated Scope & Sequence
Section C	Minor edits to Planning for Instruction
Sections D, E, F	All conditions and criteria have been revised to include references to assessment tools and standards *with some modifications to specific learner expectations*
Section G	Assessment tools have been revised and expanded
Section H	Information on linkages and transitions have been updated and reorganized
Section I	Resource lists have been updated to include new resource approvals
Section J	Sample student learner guides have minor revisions, particularly to "HOW will your mark be determined?" and "WHICH resources may you use?"
Section K	Acknowledgments are not included in this version

In May 1997, the Guides to Standards and Implementation will be revised again in preparation for provincial implementation in September 1997.

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CAREER AND TECHNOLOGY STUDIES

PROGRAM PHILOSOPHY/RATIONALE

Through Career and Technology Studies (CTS), secondary education in Alberta is responding to the many challenges of modern society, helping young people develop daily living skills, and nurturing a flexible, well-qualified work force.

In Canada's information society, characterized by rapid change in the social and economic environment, students must be confident in their ability to respond to change and successfully meet the challenges they face in their own personal and work lives. In particular, they must make decisions about what they will do when they finish high school. Many students will enter the work force, others will continue their education. All students face the challenges of growing independence and responsibility, and of entering the highly competitive workplace and/or post-secondary programs.

Secondary schools also face challenges. They must deliver, on a consistent basis, high quality, cost-effective programs that students, parents and community find credible and relevant.

CTS helps schools and students meet these challenges. Schools can respond more efficiently and effectively to student and community needs and expectations by using the opportunities in the CTS curriculum to design courses and access school, community and distance learning resources. Students can develop the confidence they need as they move into adult roles by assuming increased responsibility for their learning; cultivating their individual talents, interests and abilities; and defining and acting on their goals.

As an important component of basic education in Alberta secondary schools, CTS promotes students' achievement by setting clear expectations and recognizing students' success. Students in CTS develop competencies—that is, the knowledge, skills and attitudes students must demonstrate, or what they know and can do.

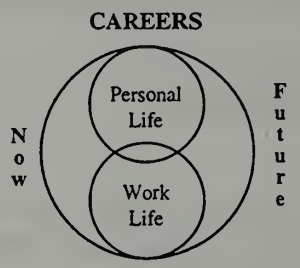
These competencies can be applied now and in the future as students make a smooth transition into adult roles in the family, community, workplace and/or further education. To help ensure this transition for students, clearly stated expectations and standards have been defined with the assistance of teachers, business and industry representatives and post-secondary educators.

CTS offers *all* students important learning opportunities. Regardless of the particular area of study chosen, students in CTS will:

- develop skills that they can apply in their daily lives now and in the future
- refine career-planning skills
- develop technology-related skills
- enhance employability skills
- apply and reinforce learnings developed in other subject areas.

In CTS, students build skills they can apply in their everyday lives. For example, in the CTS program, particularly at the introductory levels, students have the opportunity to improve their ability to make sound consumer decisions, and to appreciate environmental and safety precautions.

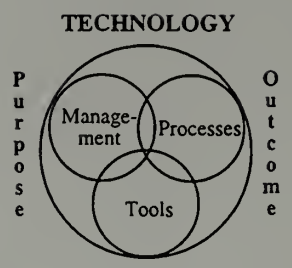
A career encompasses more than activities related to a person's job or occupation; it involves one's personal life in both local and global contexts; e.g., as a family member, a friend, a community volunteer, a citizen.



The integration of careers throughout the CTS program helps students make effective career decisions and target their efforts. Students in CTS will have the opportunity to expand their knowledge about careers, occupations and job opportunities and the education and/or training requirements involved. As well, they will recognize the need for lifelong learning.

Students in CTS will have the opportunity to use and apply technology and systems effectively and efficiently, which involves:

- a decision regarding which processes and procedures best suit the task at hand
- the appropriate selection and skilled use of the tools or resources that are available
- an assessment of and management of the impact the use of the technology may have on themselves, on others and on the environment.



Integrated throughout CTS are employability skills, those basic competencies that help students develop their personal management and social skills. Personal management skills are improved as students take increased responsibility for their learning, design innovative solutions to problems or challenges, and manage resources effectively and efficiently. Students' social skills improve through learning experiences that require them to work effectively with others, demonstrate teamwork and leadership, and maintain high standards in safety and accountability.

Further enhancing the employability skills, CTS reinforces and enhances learnings developed in core and other complementary courses. The curriculum emphasizes, as appropriate, the effective application of communication and numeracy skills.

Finally, in addition to the common outcomes described above, those students who focus on a particular area of study will develop career-specific competencies that support entry into the workplace and/or related post-secondary programs. Career-specific competencies can involve understanding and applying appropriate terminology, processes and technologies related to a specific career, occupation or job.

GENERAL LEARNER EXPECTATIONS

General learner expectations describe the basic competencies that are integrated throughout the CTS program.

Within an applied context that is relevant to personal goals, aptitudes and abilities, the student in Career and Technology Studies will:

- demonstrate the basic knowledge, skills and attitudes necessary for achievement and fulfillment in personal life
- develop an action plan that relates personal interests, abilities and aptitudes to career opportunities and requirements
- use technology effectively, linking and applying available tools, management and processes to produce a desired outcome
- develop personal management skills by:
  - linking theory and practice, using resources, tools, technology and processes responsibly and efficiently (managing learning)
  - applying effective and innovative decision-making and problem-solving strategies in the design, production, marketing and consumption of goods and services (being innovative)
  - selecting relevant, goal-related activities, ranking them in order of importance, allocating necessary time, and preparing and following schedules (managing resources)
- improve social interaction skills by:
  - demonstrating flexibility and cooperative work and communication behaviors (working with others)
  - participating as a team member by working cooperatively with others and contributing to the group with ideas, suggestions and effort (teamwork and leadership)
  - demonstrating high standards of diligence, attendance and punctuality, following safe procedures consistently, and recognizing and eliminating potential hazards (demonstrating responsibility)
- demonstrate appropriate verbal, written, composition, summarization and presentation skills
- use basic computation and measurement principles accurately and efficiently.

PROGRAM ORGANIZATION

CURRICULUM STRUCTURE

Career and Technology Studies is organized into *strands* and *modules.*

Strands in CTS define competencies that help students:

- build daily living skills
- investigate career options
- use technology (managing, processes, tools) effectively and efficiently
- prepare for entry into the workplace and/or related post-secondary programs.

In general, strands relate to selected industry sectors that offer positive occupational opportunities for students. Some occupational opportunities require further education after high school, and some allow direct entry into the workplace. The industry sectors encompass both goods-producing industries, such as agriculture, manufacturing and construction, and service-producing industries, such as business services, health services, and finance and insurance services.

Modules are the building blocks for each strand. They define what a student is expected to know and be able to do (exit-level *competencies*). Modules also specify prerequisites and facility and instructional parameters, where necessary.

The competencies a student must demonstrate to achieve success in a module are defined through the *module learner expectations.* Senior high school students who can demonstrate the module learner expectations (i.e., have the designated competencies) will qualify for one credit towards their high school diploma.

Module learner expectations are a culmination of the *specific learner expectations*, which provide a more detailed framework for instruction. They define the scope and depth of knowledge, skills and attitudes the student should acquire.

The following chart shows the 22 strands that comprise the CTS program and the number of modules available in each strand.

Strand	No. of Modules
1. Agriculture	31
2. Career Transitions	23
3. Communication Technology	32
4. Community Health	31
5. Construction Technologies	46
6. Cosmetology	58
7. Design Studies	31
8. Electro-Technologies	37
9. Energy and Mines	27
10. Enterprise and Innovation	8
11. Fabrication Studies	41
12. Fashion Studies	29
13. Financial Management	15
14. Foods	37
15. Forestry	21
16. Information Processing	43
17. Legal Studies	13
18. Logistics	12
19. Management and Marketing	21
20. Mechanics	53
21. Tourism Studies	24
22. Wildlife	17

Note: *As of September 1996, all 22 strands are available for optional implementation in Alberta junior and high schools. Provincial implementation of all strands is scheduled for September 1997.*

LEVELS OF ACHIEVEMENT

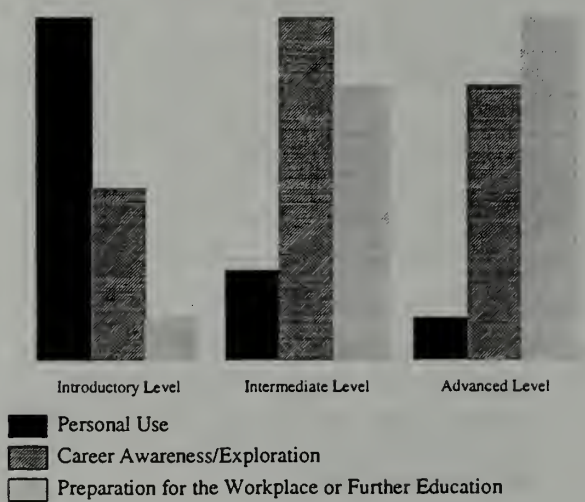
Modules are organized into three levels of achievement: introductory, intermediate and advanced. As students progress through the levels, they will be expected to meet higher standards and demonstrate increased degree of competence, both in the general learner expectations and the module learner expectations.

Introductory level modules help students build daily living skills and form the basis for further learning. Introductory modules are developed for students who have no previous experience in the strand.

Intermediate level modules build on the competencies developed at the introductory level. They provide a broader perspective, helping students recognize the wide range of related career opportunities available within the strand.

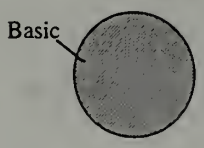
Advanced level modules demand a higher level of expertise and help prepare students for entry into the workplace or a related post-secondary program.

The following illustrates the relative emphasis on the aspects of career planning at each of the levels.



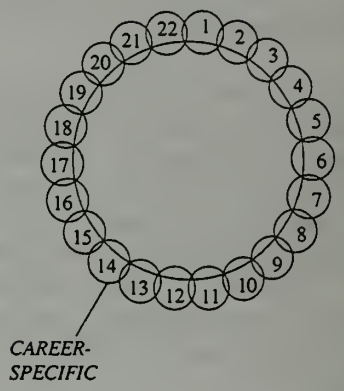
TYPES OF COMPETENCE

Two types of competence are defined within the CTS program: basic and career-specific.



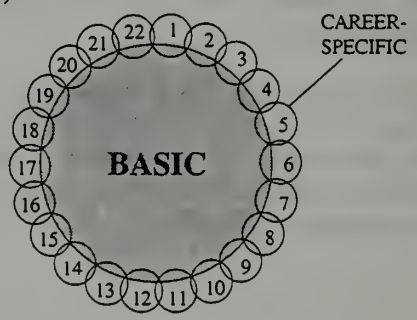
Basic Competencies are generic to any career area and are developed within each module. Basic competencies include:

- personal management; e.g., managing learning, being innovative, ethics, managing resources
- social; e.g., communication, teamwork, leadership and service, and demonstrating responsibility (safety and accountability).



Career-specific Competencies relate to a particular strand. These competencies build daily living skills at the introductory levels and support the smooth transition to the workplace and/or post-secondary programs at the intermediate and advanced levels.

The following model shows the relationship of these two types of competencies within the 22 strands of CTS (numbers refer to the chart on page A.5):



CURRICULUM AND ASSESSMENT STANDARDS

CURRICULUM STANDARDS

Curriculum standards in CTS define what students must know and be able do. Curriculum standards are expressed through general learner expectations for CTS, and through module and specific learner expectations for each strand.

ASSESSMENT STANDARDS

Assessment standards define how the student's performance will be judged. In CTS, each assessment standards defines the conditions and criteria to be used for assessing the competencies defined in each module learner expectation. Students must fully meet each assessment standard, including all of the criteria and conditions defined for the module. Assessment standards are in draft form, as are tools and weightings, and will be validated 1994–97.

Teachers throughout the province will be able to ensure students receive a fair and reliable assessment. Students will use the assessment standards to guide their efforts, ensuring they participate more effectively and successfully in the learning and assessment process. Standards at advanced levels are as much as possible linked to workplace and post-secondary entry-level requirements.

The following pages describe the Mechanics strand in the Career and Technology Studies program.

MECHANICS

STRAND RATIONALE

The movement of people and goods from one place to another has always been important to human existence. Significant advancements have occurred in the development of transportation modes over the last century which have dramatically altered the way we live and make our living. However, the quick and convenient movement of people and goods is not risk free. The ever-increasing use of motor vehicles throughout the world and their reliance on fossil fuels has created major personal safety and environmental concerns. Because the transportation industry is very large and diverse, there are many opportunities for a rewarding career, whether it is to design and build safer and more efficient vehicles or to service the ones that are already in use.

In the Mechanics strand of Career and Technology Studies (CTS), students, through hands-on experiences, have the opportunity to increase their knowledge and skills related to the design and maintenance of transportation vehicles, and the impact they have on the environment and on our economic and social well-being. Whether a student plans to prepare for a work-related role in the industry or wants to simply be an informed owner/operator of a vehicle, the Mechanics strand should be viewed as an educational opportunity for all secondary students.

More specifically, the Mechanics strand will provide students with a broad base of experience and knowledge of systems related to the transportation field, which will enable them to:

- develop the knowledge, skills and attitudes in the context of school and the community to achieve success in personal and work life
- apply effective and responsible decision-making strategies in the design, service and repair of transportation vehicles
- link the knowledge, skills and attitudes developed in other courses in meaningful and practical ways to the field of mechanics
- demonstrate flexibility, cooperative work behaviours and effective communication and leadership skills
- link theory and practice using resources, tools and materials responsibly, safely and efficiently
- develop estimating and reporting skills
- become better informed consumers
- develop technological and manual skills
- exercise safe work and environmental practices

- expand personal knowledge and appreciation of further education and career options and opportunities related to the transportation industry

- determine the economic significance of the transportation industry in the local, national and global community.

STRAND ORGANIZATION

The Mechanics curriculum development model below has been developed around four themes, which relate specifically to the design, operation and care of transportation vehicles. These themes are integrated by a number of common topics, which provide a basic framework for study in each module. The context in which the learning takes place will vary according to the experience and intent of the learner. For example, the student may be interested in vehicle ownership and/or in the preparation for the workplace. As the learner is engaged in the learning activities, specific outcomes are anticipated. These outcomes will take the form of basic, career-specific and personal goals.

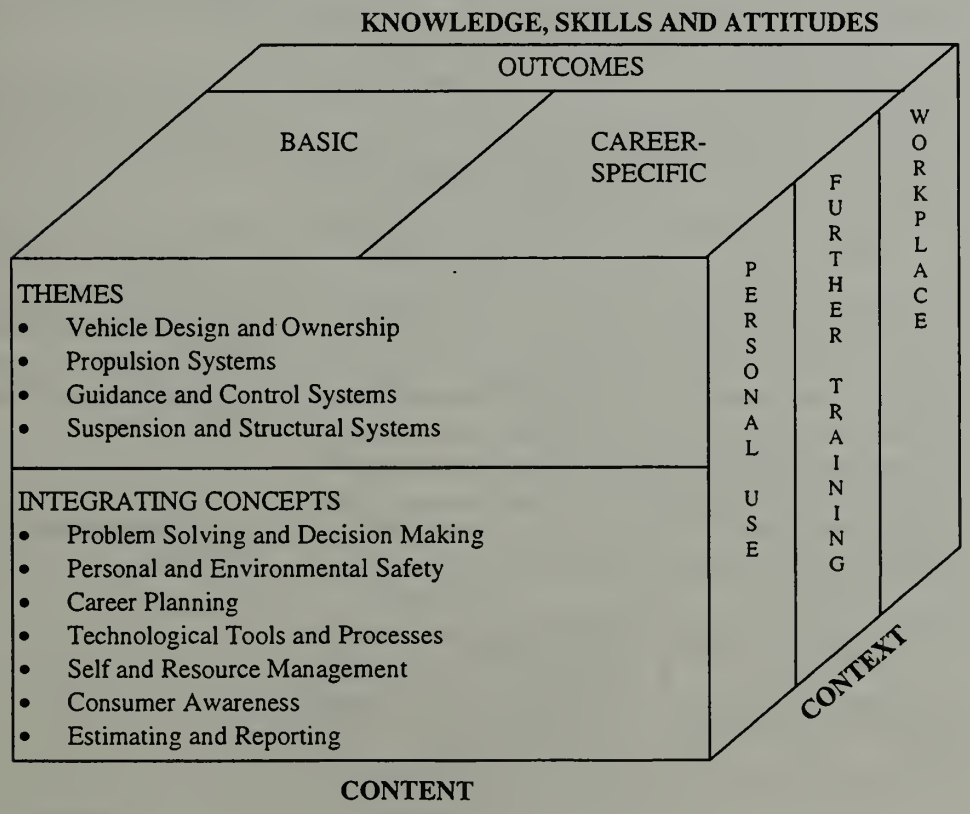
THEMES

Each level of Mechanics has major themes on which modules have been developed:

- vehicle design and ownership
- propulsion systems
- guidance and control systems
- suspension and structural systems
- project and service work.

INTEGRATING CONCEPTS

Integrating concepts, shown on the model, provide a basic framework for the study of each module. The context will vary according to resources available and interest and intent of the student after completing modules in the strand.



SCOPE AND SEQUENCE — MECHANICS

INTRODUCTORY	INTERMEDIATE	ADVANCED	THEME
Modes and Mechanisms *MEC101*	Vehicle Detailing *MEC201*	Buying and Selling a Vehicle† *MEC301*	Vehicle Design and Ownership
Vehicle Service and Care *MEC102*	Vehicle Maintenance† *MEC202*	Vehicle Value Appraisal† *MEC302*	
Engine Fundamentals *MEC104*	Lubrication and Cooling Systems† *MEC203*	Engine Performance Diagnosis *MEC303*	Propulsion Systems
	Fuel and Exhaust Systems† *MEC204*	Engine Tune-ups *MEC304*	
	Alternate Fuel Engines† *MEC205*	Engine Removal and Installation† *MEC305*	
	Ignition Systems† *MEC206*	Engine Reconditioning I† *MEC306*	
	Emission Controls† *MEC207*	Engine Reconditioning II† *MEC307*	
		Alternate Propulsion Systems† *MEC308*	
Electrical Fundamentals *MEC109*	Electrical Components† *MEC209*	Computer Management Systems† *MEC309*	Guidance and Control Systems
	Power Assist Accessories† *MEC210*	Safety Systems† *MEC310*	
Pneumatic and Hydraulic Systems *MEC111*	Braking Systems *MEC211*	Climate Control† *MEC311*	
	Hydraulic Accessories† *MEC212*	Power Assisting† *MEC312*	
Mechanical Systems *MEC113*	Power Trains† *MEC213*	Automatic Transmissions† *MEC313*	
	Manual Transmissions and Transaxles† *MEC214*	Power Train Repair† *MEC314*	
Ride and Control Systems *MEC115*	Suspension Systems *MEC215*	Wheel Alignment *MEC315*	Suspension and Structural Systems
Vehicle Structures and Materials *MEC116*	Steering Systems *MEC216*	Body Repair Estimation† *MEC316*	
Metal Forming and Finishing† *MEC117*	Metal Repair and Finishing† *MEC217*	Structural Damage Analysis† *MEC317*	
	Trim Removal and Installation† *MEC218*	Structural Damage Repair I† *MEC318*	
Surface Preparation I *MEC119*	Surface Preparation II† *MEC219*	Structural Damage Repair II† *MEC319*	
	Refinishing I† *MEC220*	Refinishing II *MEC320*	
	Basic Touch-up and Finishing† *MEC221*	Plastic and Fibreglass† *MEC321*	
	Interior Finishes and Repairs† *MEC222*	Glass Removal and Installation† *MEC322*	

——— Prerequisite ····· Recommended sequence

† Refer to specific modules for additional prerequisites and recommended sequence.

MODULE DESCRIPTIONS

Module MEC101: Modes and Mechanism
Students research, design, build and test a model of a transportation vehicle, using a simple power source, common materials and tools.

Module MEC102: Vehicle Service and Care
Students develop knowledge, skills and attitudes in the care and service of a motor vehicle.

Module MEC104: Engine Fundamentals
Students investigate and describe principles of engines, their construction and applications.

Module MEC109: Electrical Fundamentals
Students focus on the operating principles and applications of electricity.

Module MEC111: Pneumatic and Hydraulic Systems
Students focus on the operating principles and applications of pneumatic and hydraulic systems.

Module MEC113: Mechanical Systems
Students focus on the operating principles and applications of mechanisms that are used to transmit and control mechanical energy.

Module MEC115: Ride and Control Systems
Students develop a basic knowledge of ride and control mechanisms associated with vehicles.

Module MEC116: Vehicle Structures and Materials
Students identify the types of materials and components that are used in a vehicle's construction.

Module MEC117: Metal Forming and Finishing
Students create and form metal panels.

Module MEC119: Surface Preparation I
Students assess the state of a surface and follow restoration procedures.

Module MEC201: Vehicle Detailing
Students develop the skills required to restore and enhance the exterior finishes of a vehicle.

Module MEC202: Vehicle Maintenance
Students execute basic service requirements necessary to ensure the adequate maintenance of a motor vehicle.

Module MEC203: Lubrication and Cooling Systems
Students diagnose, maintain and service the lubrication and cooling systems on a typical four-cycle gasoline engine.

Module MEC204: Fuel and Exhaust Systems
Students diagnose, maintain and service the fuel and exhaust system on a typical four-cycle gasoline engine.

Module MEC205: Alternate Fuel Engines
Students explore the use of alternate fuels used to power motor vehicles.

Module MEC206: Ignition Systems
Students become familiar with the basic components and parts of ignition systems used on internal combustion engines.

Module MEC207: Emission Controls
Students gain an understanding of the importance of controlling emissions and the technology applied to vehicles in order to meet prescribed standards.

Module MEC209: Electrical Components
Students become familiar with the basic use and testing of electrical components used in a typical motor vehicle.

Module MEC210: Power Assist Accessories
Students study and identify the functions and associated parts of power assist accessories.

Module MEC211: Braking Systems
Students develop the necessary knowledge, skills and attitudes to diagnose, service and maintain a braking system according to accepted trade practice.

Module MEC212: Hydraulic Accessories
Students develop a basic knowledge of hydraulic components, applications and servicing techniques.

Module MEC213: Power Trains
Students develop their understanding of the purpose, operation and servicing of a vehicle power train.

Module MEC214: Manual Transmissions and Transaxles
Students perform inspection service and repair procedures on manual transmissions, transaxles and clutch assemblies.

Module MEC215: Suspension Systems
Students develop the knowledge, skills and attitudes needed to service and maintain vehicle suspension systems.

Module MEC216: Steering Systems
Students develop the knowledge, skills and attitudes necessary to maintain a steering system.

Module MEC217: Metal Repair and Finishing
Students repair major sheet metal damage.

Module MEC218: Trim Removal and Installation
Students explore the value, care, removal and repair of trim parts. Emphasis is on removal and installation without damage.

Module MEC219: Surface Preparation II
Students perform advanced surface preparation.

Module MEC220: Refinishing I
Students demonstrate metal surface refinishing procedures.

Module MEC221: Basic Touch-up and Finishing
Students determine and use the appropriate materials, tools and processes to make minor surface repairs.

Module MEC222: Interior Finishes and Repairs
Students research for and use the appropriate products and techniques to maintain vehicle interior surface materials.

Module MEC301: Buying and Selling a Vehicle
Students develop the skills required to make an informed purchase or sale of a vehicle.

Module MEC302: Vehicle Value Appraisal
Students develop an understanding of the use of industry standard references to arrive at an estimation of the cost of mechanical repair and the market value of a vehicle.

Module MEC303: Engine Performance Diagnosis
Students learn to trouble-diagnose an engine for worn/damaged parts and/or improper adjustments.

Module MEC304: Engine Tune-ups
Students diagnose, service and repair engine, fuel, ignition, charging and starting systems.

Module MEC305: Engine Removal and Installation
Students remove and install an engine or a chassis.

Module MEC306: Engine Reconditioning I
Students determine the need for service and perform the required service for the cylinder head and related components.

Module MEC307: Engine Reconditioning II
Students determine the need for service, and perform service on a cylinder block assembly and related components.

Module MEC308: Alternate Propulsion Systems
Students develop an understanding of why vehicle manufacturers continue to build the crank-piston, internal combustion, gasoline engine and also explore some other engine designs.

Module MEC309: Computer Management Systems
Students acquire an overview of the application of computer management systems used in modern vehicles.

Module MEC310: Safety Systems
Students gain an understanding of how safety systems can be tested, diagnosed, replaced or repaired.

Module MEC311: Climate Control
Students expand their knowledge of the purpose, operation and servicing of standard and air conditioning systems.

Module MEC312: Power Assisting
Students further develop their knowledge of the purpose, operation, service and repair of pneumatic, hydraulic and electric power assist devices.

Module MEC313: Automatic Transmissions
Students develop their knowledge of automatic transmissions and transaxles, and their skills in diagnosing and executing some automatic transmission and transaxle repair requirements.

Module MEC314: Power Train Repair
Students perform overhauls on clutch, transmission and differential assemblies.

Module MEC315: Wheel Alignment
Students develop the knowledge, skills and attitudes necessary for the alignment of various steering systems used on vehicles.

Module MEC316: Body Repair Estimation
Students learn the value of detail in the determining cost of repair, and acquire knowledge in estimating.

Module MEC317: Structural Damage Analysis
Students identify and examine physical damage caused by collision, including cost estimating procedures.

Module MEC318: Structural Damage Repair I
Students complete a repair involving removal, replacement and alignment of body parts.

Module MEC319: Structural Damage Repair II
Students examine the methods used to complete a collision repair that involves unibody parts replacement and frame correction.

Module MEC320: Refinishing II
Students demonstrate knowledge and skills of advanced finishing techniques including custom painting, mixing, tinting, colour and texture matching.

Module MEC321: Plastic and Fibreglass
Students determine the type of plastic/fibreglass material and perform the repair procedure.

Module MEC322: Glass Removal and Installation
Students gain knowledge, skill and practice related to vehicle glass installation and adjustment.

SECTION C: PLANNING FOR INSTRUCTION

The Mechanics curriculum framework ensures that students do not repeat content. Schools and teachers have maximum flexibility to design programs based on the needs and interests of their students and circumstances in the school and community. The levels framework will challenge secondary students to keep learning and will provide new and exciting opportunities at each level.

PLANNING FOR CTS

Defining Courses

Schools determine which strands and modules will be offered in a particular school, and will combine modules into courses.

Each module was designed for approximately 25 hours of instruction. However, this time frame is only a guideline to facilitate planning. The CTS curricula are competency based, and the student may take more or less time to gain the designated competencies within each module.

A course will usually consist of modules primarily from the same strand but, where appropriate, may include modules from two or more strands. Refer to the *CTS Manual for Administrators, Counsellors and Teachers* for more information on course names and course codes.

Module selection and sequencing must consider the module parameters, which define:

- prerequisite and corequisites (entry-level competencies)
- instructional qualifications, if specialized. When student are engaging modules that include tasks performed on road-licensed vehicles, tasks such as brakes, steering and suspension require supervision by a journeyman. Students seeking articulation with trade apprenticeship must be taught/supervised by someone with journeyman status.
- equipment and facility requirements, if specialized.

The module parameters are defined for each module, in Sections D, E and F of this Guide

Degree of Flexibility

The CTS program, while designed using the modular structure to facilitate flexible time-tabling and instructional delivery, does not mandate the degree of flexibility a school or teacher will offer. The teacher and school will determine the degree of flexibility available to the student. Within the instructional plan established by the school, the student may:

- be given the opportunity to progress at a rate that is personally challenging
- have increased opportunity to select modules that develop competencies he or she finds most relevant.

Integrating Basic Competencies

Basic competencies are integrated throughout the CTS program and within each module. Selected basic competencies will be emphasized within a module, depending on the nature of the career-specific competencies defined for the module.

Refer to Section G (Assessment Tools) of this Guide for the description of student behaviours expected at each of the four developmental stages defined for the basic competencies.

Assessment of basic competencies could include input and reflection involving the student, teacher(s), peers and others. Description of the observed behaviour could be provided through a competency profile for the module. Positive, ongoing interaction between the student and teacher will support motivation for student growth and improvement.

The basic competencies related to safety, service teamwork and accountability should be emphasized in Mechanics modules, particularly at the advanced level where industry-based activities and projects would be appropriate.

Although no mark would be assigned to the student's performance in the designated basic competencies, observations of performance should be included within the assessment of each module.

Assessing Student Achievement

Assessing the student's competency is a process of gathering information by way of observations of process, product and student interaction.

Where appropriate, assessment tools have been defined to assist the teacher and student in the assessment. Refer to Section G (Assessment Tools) of this Guide for copies of the various tools (worksheets, checklists, sample questions, etc.).

A suggested emphasis for each assessment standard has also been established. The suggested emphasis provides a guideline to help teachers determine time allocation and/or a percentage grade for students.

Recognizing Student Achievement

At the high school level, successful demonstration of the exit-level competencies in a module qualifies the student for one credit. Refer to Section A of this Guide for more detailed information about how curriculum and assessment standards are defined in CTS. Refer to the *CTS Manual for Administrators, Counsellors and Teachers* for more information on how student achievement can be recognized and reported at the school and provincial levels.

Resources

A comprehensive resource base, including print, software and audio-visual has been identified to support the Mechanics strand. It is intended that these resources will form the basis of a resource centre, encouraging teachers and students to access a wide selection of resources and other information sources throughout the learning process. Unless otherwise noted, these resources are considered to be suitable for both junior and senior high school students.

Authorized resources may be obtained from the Learning Resources Distributing Centre or directly from the publisher or distributor. Refer to Section I (Learning Resources Guide) for the complete resource list including curriculum correlations and resource annotations. Additional sources refer to non-commercial or government agencies that offer resources that may be of assistance in this strand.

In addition to the resources, sample Student Learning Guides are available. These samples, designed for individual student or small group use, provide an instructional plan for selected modules and include the following components:

- Why take this module?
- What are the entry-level competencies?
- What are the exit-level competencies?
- What resources may be accessed?
- What assignments/activities must be completed?
- What are the timelines?
- How will the final mark be calculated?

Sample Student Learning Guides have been developed for the following modules in Mechanics:

- Modes and Mechanisms
- Vehicle Service and Care
- Vehicle Detailing.

Copies of these sample learning guides can be obtained, by request, from the CTS Unit in print and/or disk format (Microsoft Word).

PLANNING FOR MECHANICS

The following suggestions are provided to assist teachers and school and school system administrators as they plan to deliver modules from the Mechanics strand.

Selecting Modules

The scope and sequence chart in Section B provides an overview of the Mechanics modules, indicating theme areas. Brief descriptions of the modules are in Section B.

Course planning should take into consideration module sequences that link with both physical and human resources present in the school and community.

Mechanics for Junior High School Students

The introductory level modules may be offered in part on in whole at the junior high level. As available resources in each school and community will vary, it is important to assess potential support networks prior to selecting module sequences.

The number of modules will vary according to the time available throughout Grades 7, 8 and 9:

Time Available	Modules
8 – 25 hours	**Modes and Mechanisms**
50 hours	**Mechanical Systems** **Engine Fundamentals**
75 – 100 hours	*add one or two of the following:* **Vehicle Service and Care** **Electrical Fundamentals** **Vehicle Structures and Materials** **Metal Forming and Finishing**

Where appropriate, junior high school students may also take intermediate level modules, particularly in the Vehicle Design and Ownership theme.

Modules may be combined into courses and offered within a school year or over a span of a few years.

Mechanics for Senior High School Students

Following are a few examples of module groupings into sample courses:

3 credits (no previous strand experience) with a focus on vehicle ownership	**Vehicle Service and Care** **Vehicle Detailing** **Vehicle Maintenance** **Buying and Selling a Vehicle** **Vehicle Value Appraisal**
3 credits (strong background from junior high school) with a focus on the automobile	**Electrical Fundamentals** **Ride and Control Systems** **Vehicle Structures and Materials** **Vehicle Maintenance**
5 - 10 credits (foundation for workplace/post-secondary entry in technical/ support positions involving motor vehicles	**Lubrication and Cooling Systems** **Fuel and Exhaust Systems** **Ignition Systems** **Electrical Components** **Braking Systems** **Power Trains** **Manual Transmissions and Transaxles** **Suspension Systems** **Steering Systems** **Engine Performance Diagnosis**
5 - 10 credits (foundation for entry into post-secondary programs in Autobody)	**Metal Forming and Finishing** **Surface Preparation I** **Metal Repair and Finishing** **Surface Preparation II** **Refinishing I** **Basic Touch-up and Finishing** **Body Repair Estimation** **Structural Damage Analysis** **Structure Damage Repair I** **Structure Damage Repair II** **Refinishing II**

Modules could also be grouped into comprehensive courses that develop competencies relevant to career paths within a specific industry.

Organizing for Learning

A "learn by doing" approach is recommended for the Mechanics strand. Essentially, the teacher's role will become that of guide and partner in the learning process. The "learn by doing" approach requires the teacher to be facilitator and coach, rather than subject-based expert, as students

actively participate in learning by doing and discovering.

Small group instruction is a good way to foster learning by doing and discovering. Small groups enable students to be active participants in learning, and develop independent and responsible learning habits. As students work in small group situations they will share information, solve problems, develop consensus, and help each other learn content and processes.

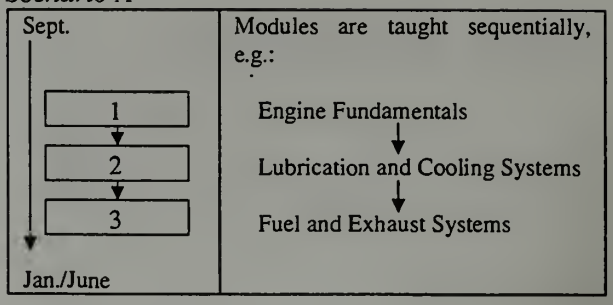
The community is a major stakeholder in education and can be an effective partner in the learning process. The use of community members and resources should be integrated into course planning. Business, industry and government agencies offer a wide range of services and resources, as do local clubs, service groups and institutions. When planning for the use of community resources, teachers should ensure that related presentations and/or activities:

- are consistent with student knowledge and skill levels
- demonstrate sound pedagogy
- are exemplary of approved health and safety standards
- provide a balanced approach to curriculum topics and related issues.

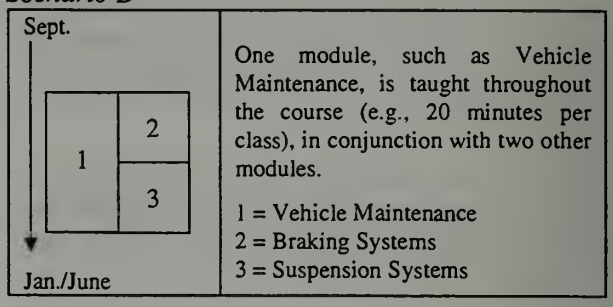
Prior to selecting modules, teachers should check the module parameters outlined in each module (see Sections D, E and F of this Guide). These module parameters, in addition to identifying prerequisite or corequisite modules, assist in identifying community partners and resources when required.

Modules can be delivered sequentially, concurrently or combined. For example, if an instructional block of safety is desired, the safety aspects of several modules could be combined.

Scenario A

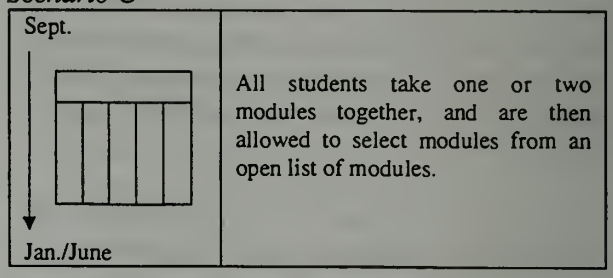


Scenario B

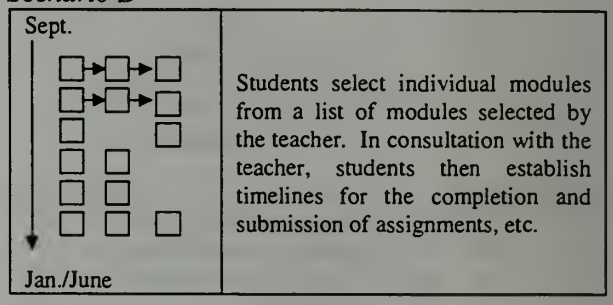

Sept.
1
2
3
Jan./June
One module, such as Vehicle Maintenance, is taught throughout the course (e.g., 20 minutes per class), in conjunction with two other modules.
1 = Vehicle Maintenance
2 = Braking Systems
3 = Suspension Systems

Teachers can also allow students to progress at a rate that is personally challenging.

Scenario C


Sept.
Jan./June
All students take one or two modules together, and are then allowed to select modules from an open list of modules.

Scenario D


Sept.
Jan./June
Students select individual modules from a list of modules selected by the teacher. In consultation with the teacher, students then establish timelines for the completion and submission of assignments, etc.

Plans for instruction must address social, economic and environmental perspectives related to resource development. Provide opportunities for students to become involved in learning experiences that reflect a broad understanding of related issues and alternatives. Presentations of course content that reflect a singular or narrow

view of mechanics are not consistent with learner expectations and must be avoided.

As in all CTS strands, students will identify, explore and prepare for future career opportunities. It is recommended that course planning include the integration of relevant career investigations throughout each module, rather than as a singular or isolated study. Career profiles, interviews and job shadowing will acquaint students with the many technical and professional careers associated with the mechanics field.

Addressing Safety in Off-campus Excursions

Field excursions are recommended and should be an important part of teaching and learning throughout the Mechanics strand. Safety must be a prime consideration in planning off-campus learning experiences. Both teachers and students should engage in activities commensurate with their level of training and ability. Adequate instructional support, guidance and supervision must be provided at all times. Local jurisdiction and school policies must be understood and observed by principals, teachers, parents, supervisors and students.

Preparation and Risk Anticipation

The preparation stage is the most important part of any off-campus excursion. At this stage of planning, potential risks can be anticipated and either avoided or moderated. The preparation stage should focus attention on:

- trip administration, including the use of parental permission forms, health information forms, school/system authorization forms and accident report forms
- a review of laws and regulations relevant to the excursion and activities that will be undertaken
- study of the site to which the trip is being conducted, and the identification of potential hazards and risks
- determination of group size and the level of supervision that will be required (i.e., supervisor/student ratio)
- a briefing of parents, school administrators, government/industry authorities or others who should be informed in the event of an accident regarding itineraries, participants and emergency response plans
- pre-trip logistics, including transportation, equipment, facility and departure date considerations
- student preparation, including background knowledge and experience, medical problems and/or needs, mental and physical preparedness, and training in specific skill areas.

On-site Risk Management

Safety and risk management involves exercising situation-specific judgement throughout the course of an off-campus excursion. Judgement is the product of experience, and may include recognizing factors such as dangers imposed by equipment, a decline in physical strength, or a more challenging task. Many of the hazard recognition skills can be taught in the classroom in the preparation stage.

A significant aspect of on-site risk management is group management. Teachers can exercise appropriate group management strategies by focusing attention on:

- pacing and observation distance, including speed of travel, rest stops, distance travelled and maintaining safe distance for observations
- group control, including position of leader, regrouping procedures, signal systems and buddy systems
- the establishment of group rules and norms
- clearly defined task allocations for each student
- objective hazard recognition on the site, including machinery and equipment.

Identifying Linkages

Section H of this Guide describes linkages within CTS strands.

Note that project modules from the Career Transitions strand may be combined with modules from Mechanics to provide increased opportunity for students to develop expertise and refine their competencies. Project modules are **not** designed to be offered as distinct courses and should **not** be used to extend Work Experience 15, 25 and 35 courses.

Improving Smooth Transitions to the Workplace and/or Post-secondary Programs

Refer to Section H of this Guide for potential transitions students may make into:

- the workplace
- related post-secondary programs or other avenues for further learning.

MODULE CURRICULUM AND ASSESSMENT STANDARDS:

SECTION D: INTRODUCTORY LEVEL

The following pages define the curriculum and assessment standards for the introductory level of Mechanics.

Introductory level modules help students build daily living skills and form the basis for further learning. Introductory modules are developed for students who have no previous experience in the strand.

Module learner expectations define the competencies a student must demonstrate to achieve success in a module. Assessment standards define the conditions and criteria to be used for assessing the competencies defined in the module learner expectations. These assessment standards and the accompanying assessment tools are in draft form and will be validated from 1994 to 1996.

Specific learner expectations provide a detailed framework for instruction to help students build the competencies defined in the module learner expectations. Additional information and suggestions for instruction are provided in the Notes column; teachers may wish to use this space to record their ideas for instruction or student projects.

Module MEC101:	Modes and Mechanisms	D.3
Module MEC102:	Vehicle Service and Care	D.7
Module MEC104:	Engine Fundamentals	D.13
Module MEC109:	Electrical Fundamentals	D.17
Module MEC111:	Pneumatic and Hydraulic Systems	D.21
Module MEC113:	Mechanical Systems	D.25
Module MEC115:	Ride and Control Systems	D.29
Module MEC116:	Vehicle Structures and Materials	D.33
Module MEC117:	Metal Forming and Finishing	D.37
Module MEC119:	Surface Preparation I	D.41

MODULE MEC101: MODES AND MECHANISMS

Level: **Introductory**

Theme: **Vehicle Design**

Prerequisite: **None**

Module Parameters: **Access to basic hand tools**

Students research, design, build and test a model of a transportation vehicle, using a simple power source, common materials and tools.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate the safe use of tools and follow established lab procedures	• observed performance related to: – following established shop/lab routines – maintaining a safe and tidy workplace – selecting and safely using tools. *Assessment Tool* *Laboratory Practice: Part 1, MEC101–1* *Standard* *Performance rating of 3 on each criteria*	10
• list and describe the systems that are common to all modes of transportation	• listing and describing systems common to all modes of transportation. *Assessment Tool* *Laboratory Practice: Part 2, MEC101–1* *Standard* *Performance rating of 1 on each criteria*	20
• research, design, build and test a concept vehicle	• observed performance relative to: – research skills – designed product – built product – test product. *Assessment Tool* *Laboratory Practice: Part 3, MEC101–1* *Standard* *Performance rating of 1 on each criteria*	70

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • demonstrate basic competencies.	*Assessment of student achievement will be based on:* • observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow safety rules and guidelines related to the use of basic hand and power tools • recognize the hazards associated with the use of: – compressed gases – liquids under pressure – flammable materials – components under tension.	Personal property environment.
Identify/Function	• identify a transportation mode that can be used to move passengers or goods in a: – terrestrial – marine – atmospheric – space environment • determine, in a given environment, what forces must be overcome to start and keep a vehicle/craft in motion • list and describe the function of the following systems: – propulsion – guidance – control – suspension – structural – solar and wind – alternative sources.	

MODULE MEC101: MODES AND MECHANISMS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • describe and demonstrate how energy is used to produce motion using: – gravity – elastic or spring materials under tension – compressed gases – liquids under pressure – electromagnets – combustion • identify and compare the guidance and control mechanisms that are used in connection with a: – land vehicle – marine craft – air craft – space craft • identify and compare the means by which a vehicle or craft is supported: – on land – in air, water or space • identify the types of structures and materials that are used to support vehicular systems and provide maximum safety and performance.	
Application	• research, design and construct a vehicle or craft for a predetermined use.	Follow design process. Projects depend on the selection of transportation mode and propulsion system. Project examples are: • CO_2 powered craft/ vehicle • solar powered • rubber band powered • battery powered • bottle sockets.

MODULE MEC101: MODES AND MECHANISMS (continued)

Concept	Specific Learner Expectations	Notes
Testing/Evaluation	*The student should:* • identify an appropriate measurement technique to assess applicable factors such as: – speed – pulling power – payload – efficiency • describe operation and construction of the transportation vehicle.	Suggest self-evaluation.
Portfolio Development	• keep notes, sketches, work drawings, pictures and performance records.	

MODULE MEC102: VEHICLE SERVICE AND CARE

Level: **Introductory**

Theme: **Vehicle Design and Ownership**

Prerequisite: **None**

Module Parameters: **Access to commercially available products and related resources**

Instructional Qualification: Client work must be checked by qualified technician

Students develop knowledge, skills and attitudes in the care and service of a motor vehicle.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe use of tools and established lab procedures	• observed performance related to: – following established shop lab procedures – proper handling of vehicle fluids – safe handling of vehicle cosmetic/cleaning products – maintaining a safe/tidy workplace. *Assessment Tool* *Vehicle Service and Care: Part 1, MEC102–1* *Standard* *Performance rating of 3 on each criteria*	10
• develop a service schedule for a vehicle as a means of preventive maintenance	• developed service schedule for a given vehicle considering the following: – items to be checked, serviced or replaced – items to be included are fluids, filters, tires, belts/chains, battery and lights – distance/time intervals and operating conditions. *Assessment Tool* *Vehicle Service and Care: Part 2, MEC102–1* *Standard* *Performance rating of 1 on each criteria*	15

MODULE MEC102: VEHICLE SERVICE AND CARE (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• inspect and service a vehicle as outlined in the vehicle service schedule	• observed performance in: – completion of schedule – selection and use of resources – time on task – see the value in the task. *Assessment Tool* *Vehicle Service and Care: Part 3, MEC102–1* *Standard* *Performance rating of 1 on each criteria*	50
• clean and apply a protective coating to the exterior and interior surfaces of a vehicle in preparation for use or storage	• observed performance in cleaning and applying protective coatings to a given vehicle, observing the following: – proper selection and use of equipment/materials – quality of completed task – ability to problem solve – time on task. *Assessment Tools* *Vehicle Service and Care: Part 4, MEC102–1* *Standard* *Performance rating of 1 on each criteria*	25
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and assessment tools noted above*	Integrated throughout

MODULE MEC102: VEHICLE SERVICE AND CARE (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow practices that promote safety and protect the environment.	
Consumer Awareness	• write up a repair order • explain why preventive maintenance can: – avoid expensive repairs – improve reliability and safety – improve efficiency – extend the life of the vehicle • identify and locate a vehicle's major mechanical and structural components that need regular service and care • identify and safely use common mechanics hand tools and equipment • determine from the owner's manual the recommended: – type and grade of motor oil – type of engine coolant – brake fluid – power steering fluid – transmission fluid – type of air, oil and fuel filters • determine what type of maintenance can be safely done by students • list characteristics of an appropriate service centre and technician • identify potential trouble signs such as: – warning lights or gauges – unusual odours or noises – fumes – leaks – other.	Emphasize legal aspects.

Concept	Specific Learner Expectations	Notes
Consumer Awareness (continued)	*The student should:* • describe what steps should be taken when a vehicle is stored for a period of time • explain why it is necessary to shelter or protect a vehicle from: – the sun's radiation – salt – heat and cold – other.	
Inspect/Service	• complete a visual inspection of: – fluid levels – hose and belt condition – tire pressure and condition – lights and accessories – battery condition – other • prepare a service schedule using the owner's manual or a shop manual to determine when to: – change lubrication fluids – replace filters – drain and replace coolants – lubricate body components – inspect and lubricate suspension and steering joints – inspect brake linings – repack bearings – rotate tires – other • demonstrate the procedure used to: – replace engine motor oil, coolant and filters – lubricate chassis and body parts – clean and check the battery condition – rotate tires – check tire pressure – dispose of used fluids and parts – other	Routine battery service. Should meet local conditions.

MODULE MEC102: VEHICLE SERVICE AND CARE (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Service (continued)	*The student should:* • identify and demonstrate the use of products that can be safely used to: – clean a painted surface – degrease components – wax and polish a surface – other; e.g., chip protection	For example, head lamp covers, nose guards, mud flaps, side protection moldings.
	• list items to be taken on trips (winter, summer)	Emergency kit.
	• remove and replace tire and rim from a vehicle	Using vehicle jack and wheel wrench.
	• boost (jump-start) a vehicle	Follow recommended procedure to avoid damage to vehicle or battery explosion.
	• perform basic troubleshooting on a stalled vehicle.	
Careers	• investigate further education, work conditions and opportunities.	

MODULE MEC104: ENGINE FUNDAMENTALS

Level: **Introductory**

Theme: **Propulsion Systems**

Prerequisite: **None**

Module Parameters: **Access to engine measuring tools, related resources, engine samples**

Students investigate and describe principles of engines, their construction and applications.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate the safe use of tools and follow established lab procedures	• ability to: – follow established lab procedures – select proper tools – demonstrate safe use of tools – understand hazards of gasoline and other fuels. *Assessment Tool* *Engine Fundamentals: Part 1, MEC104–1* *Standard* *Performance rating of 2 on each criteria*	10
• compare the operating principles of engine types	• a report comparing the operating principles of the following engine types: – two-stroke cycle – four-stroke cycle. *Assessment Tool* *Engine Fundamentals: Part 2, MEC104–1* *Standard* *Performance rating of 1 on each criteria*	20

MODULE MEC104: ENGINE FUNDAMENTALS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• determine the condition of an engine	• problem solving the condition of a given engine, demonstrating the following: – use of resources – determining mechanical condition including compression pressures – spark plug voltages and spark timing – fuel supply to the cylinder – engine measurements for bore, stroke and displacement). *Assessment Tool* *Engine Fundamentals: Part 3, MEC104–1* *Standard* *Performance rating of 1 on each criteria*	60
• describe the by-products of combustion and their impact on the environment	• listing/describing of combustion by-products and their impact on the environment, including the following: – carbon dioxide – carbon monoxide – oxides of nitrogen – particulates. *Assessment Tool* *Engine Fundamentals: Part 4, MEC104–1* *Standard* *Performance rating of 1 on each criteria*	10
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and assessment tools noted above*	Integrated throughout

MODULE MEC104: ENGINE FUNDAMENTALS (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures • describe the hazards associated with: – gasoline and other flammable liquids – exhaust gases – hot coolants	
Identify/Function	• identify and use measuring tools in both imperial and metric, such as: – steel rule – calipers and dividers – micrometer – dial indicator – torque wrench – pressure gauges – other. • identify and use fasteners associated with engines (measurements in both imperial and metric), such as: – bolts, studs and nuts – washers – pins – keys – snap rings – machine screws – other • describe the effects of heating a gas in an enclosed space • identify the types of fuels commonly used in combustion engines • describe the by-products of combustion and their effects on health and the environment. • determine the difference between an internal and an external combustion engine • identify the type of engines and fuels that are used for air, land, sea and space applications.	

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • recognize and label the major parts of a reciprocating engine • demonstrate how reciprocating motion is converted to rotary motion • examine and explain the difference between a two- and a four-stroke cycle engine • explain the purpose of the following support systems: – cooling – lubrication – ignition – fuel – exhaust • demonstrate how engines differ according to their: – number of cylinders – design – size – make and model – other • determine the condition of an engine.	Purpose only.
Identify/Analysis	• apply resources to locate: – service bulletins and repair manuals – engine specifications – parts numbers and assembly procedures.	
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC109: ELECTRICAL FUNDAMENTALS

Level: **Introductory**

Theme: **Guidance and Control Systems**

Prerequisite: **None**

Module Parameters: **Access to multimeter, battery hydrometer, battery charger, related battery tools, electrical supplies**

Students focus on the operating principles and applications of electricity.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate following established lab procedures including batteries and use of electrical meters	• observed performance related to: – following established lab/shop procedures related to: • personal protective equipment • recognizing electrical hazards • storage battery handling/service • use of electrical meters. *Assessment Tool* *Electrical Fundamentals: Part 1, MEC109–1* *Standard* *Performance rating of 1 on each criteria*	15
• describe and apply the electrical principles and concepts	• observed performance in: – recognition of series and series parallel circuits on a vehicle – measuring voltages, resistances and current flow in lighting, charging and starting systems – testing a battery. *Assessment Tool* *Electrical Fundamentals: Part 2, MEC109–1* *Standard* *Performance rating of 1 on each criteria*	85

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • demonstrate basic competencies.	*Assessment of student achievement will be based on:* • observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • safely use tools/equipment and follow established lab procedures • be aware of causes of battery explosion/acid burner • be aware of electrical shock/burns/fires • outline a plan of action when an accident occurs.	Face/eye protection when working around batteries.
Identify/Function	• observe and describe magnetic attraction and repulsion between two magnets • produce a temporary and permanent magnet • determine the polarity of an electromagnet • describe the electron theory in relation to the parts of an atom • describe production of electricity: – chemically – thermally – photoelectrically – piezoelectrically – electromagnetically • explain the difference between AC and DC current.	Static charges: how produced and effect on a vehicle.

MODULE MEC109: ELECTRICAL FUNDAMENTALS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • identify and label the parts of a simple circuit • recognize the physical form and circuit symbol of a: – light – motor – heating element – solenoid – fuse – other • determine what conditions create: – an open circuit – a closed circuit – a short circuit – a grounded circuit • describe how a frame-ground circuit operates on a motor vehicle • define what is meant by: – amperage – voltage – resistance • compare electrical factors with factors in a fluid system	
Inspect/Service	• construct and compare a series and a parallel circuit • measure, with appropriate meters, the resistance, voltage and amperage in a given circuit • determine the relationship that exists among the amperage, voltage and resistance within a circuit • determine condition of a battery and service.	Develop a working model, block diagrams of lighting, starting charging system. Battery explosion precaution.
Career Exploration	• identify further education and work opportunities related to electrical fundamentals.	

MODULE MEC111: PNEUMATIC AND HYDRAULIC SYSTEMS

Level: **Introductory**

Theme: **Guidance and Control Systems**

Prerequisite: **None**

Module Parameters: **Access to related pneumatic/hydraulic units and resources**

Students focus on the operating principles and applications of pneumatic and hydraulic systems.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate the safe use of tools and follow established lab procedures when working with pneumatic and hydraulic systems	• observed performance related to: – recognition of dangers involved when working with pressurized pneumatic and hydraulic systems – selection and safe use of tools – clean-up of hydraulic fluids. *Assessment Tool* *Pneumatic and Hydraulic Systems: Part 1, MEC111–1* *Standard* *Performance rating of 2 on each criteria*	10
• compare the operating principles of pneumatic and hydraulic systems	• comparing operating principles of pneumatic and hydraulic systems indicating: – units involved – sample systems on vehicles. *Assessment Tool* *Pneumatic and Hydraulic Systems: Part 2, MEC111–1* *Standard* *Performance rating of 1 on each criteria*	30

MODULE MEC111: PNEUMATIC AND HYDRAULIC SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• apply the principles and concepts related to the use of pneumatic and hydraulic systems	• observed performance in recognizing and using one pneumatic and one hydraulic system – exploring career opportunities. *Assessment Tool* *Pneumatic and Hydraulic Systems: Part 3, MEC111–1* *Career Profile, MECCP–1* *Standard* *Performance rating of 1 on each criteria* *Completing all sections of the profile*	60
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. – explore career opportunities. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow laboratory safety procedures • list hazards related to working with fluids under pressure and related equipment • list hazards related to pneumatics.	
Identify/Function	• state why fluid systems are widely used in transportation and power application • contrast hydraulic and pneumatic systems • observe and demonstrate how pressure affects a liquid and a gas in an enclosed space • determine what units are used to measure pressure in a fluid.	

MODULE MEC111: PNEUMATIC AND HYDRAULIC SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • determine what units are used to calculate the flow of fluid past a point • demonstrate the relationship between flow rate and pressure in a fluid system • examine how a small force can be multiplied in a fluid system • contrast the action of common pumps and compressors such as: – impeller – gear – piston – diaphragm – vane type • locate examples of these pumps and compressors in a motor vehicle or some other power system • observe and demonstrate the use of valves to control: – direction of fluid motion – pressure of fluids – flow rate of fluids • locate valves on a given vehicle • observe and demonstrate how fluids under pressure can be used to move a: – motor – cylinder – diaphragm • identify and operate pneumatic and hydraulic units on a given vehicle • describe the principles in a fluid system such as: – hydraulic hoist – hydraulic brakes.	
Inspect/Repair	• double and single flare a steel line and indicate when each flare should be used	

Concept	Specific Learner Expectations	Notes
Career Exploration	*The student should:* • identify further education and work opportunities related to pneumatic and hydraulic systems.	

MODULE MEC113: MECHANICAL SYSTEMS

Level: **Introductory**

Theme: **Guidance and Control Systems**

Prerequisite: **None**

Module Parameters: **Access to examples of mechanical units and related resources**

Student focus on the operating principles and applications of mechanisms that are used to transmit and control mechanical energy.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate the safe use of tools and follow established lab procedures	• observed performance related to: – following established shop/lab routines – proper selection and safe use of tools – use of guards and shields. *Assessment Tool* *Mechanical Systems: Part 1, MEC113–1* *Standard* *Performance rating of 2 on each criteria*	10
• describe the principles and concepts related to the use of mechanisms to control and transmit force and motion in a vehicle	• report listing/describing and providing sample applications of the following: – simple machines – types of mechanical motion – direct and indirect power transmission units – conversion of mechanical energy. *Assessment Tool* *Mechanical Systems: Part 2, MEC113–1* *Standard* *Performance rating of 1 on each criteria*	30

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • apply the principles and concepts of mechanical systems	*Assessment of student achievement will be based on:* • observed performance on a given mechanical unit determining the following: – torque and gear ratios – mechanical advantage – coefficient of friction. *Assessment Tool* *Mechanical Systems: Part 3, MEC113–1* *Standard* *Performance rating of 1 on each criteria*	60
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow laboratory safety procedures • explain dangers associated with rotating/moving components.	Clothing, hair entanglement.
Identify/Function	• discuss the application of mechanical systems that are found in all aspects of human endeavour • demonstrate the use of simple machines to change the: – direction in which a force acts – size of the force – place where the force acts.	Group activity.

Concept	Specific Learner Expectations	Notes
	The student should:	
Identify/Function (continued)	• devise or locate a mechanism that produces: – linear motion – reciprocating motion – oscillating motion – rotary motion – other	Bicycle drive mechanism. Model engines.
	• observe and graph the action of a cam as it changes rotary motion to linear motion	
	• explain the difference between direct and indirection transmission of power	Use of sample transmissions/rear axles; e.g.,
	• describe the purpose and types of: – shafts – couplers – universal joints – pins – others	• lawn mowers (self-propelled) • riding mowers • basic automobile, transmissions, drive shafts, differentials.
	• observe and demonstrate the use of simple machines to: – start and stop motion – change directions – increase or decrease speed – increase or decrease torque	10-speed bicycle transmissions.
	• describe the relationship between torque, velocity and gear ratios	
	• explain why friction has both positive and negative attributes	Use/construct unit similar to oil additive demonstration unit.
	• compare the coefficient of friction between two different materials	
	• determine how friction can be increased or decreased in a mechanical system	
	• calculate the mechanical advantage of one or more mechanisms to determine the efficiency of the system.	

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • explain how mechanical energy can be changed to: – heat energy – electrical energy – fluid energy – other.	
Inspect/Service	• list, observe and service mechanical systems on a given vehicle.	Service and repair a bicycle, rototiller, garden tractor, etc.

MODULE MEC115: RIDE AND CONTROL SYSTEMS

Level: **Introductory**

Theme: **Suspension and Structural Systems**

Prerequisite: **None**

Module Parameters: **Access to floor jack, safety stands, suspension/steering system and related resources**

Students develop a basic knowledge of ride and control mechanisms associated with vehicles.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate the safe use of tools and follow established lab procedures	• observed performance related to: – following established shop/lab routines – use of floor jack and safety stands. *Assessment Tool* *Ride and Control Systems: Part 1, MEC115–1* *Standard* *Performance rating of 2 on each criteria*	10
• describe the purpose, operation and interdependent nature of ride and control systems	• report showing purpose and operation of suspension, steering and braking system used on land vehicles and aircraft • report showing how hydraulics, pneumatics and electrical are applied to ride and control systems. *Assessment Tool* *Ride and Control Systems: Part 2, MEC115–1* *Standard* *Performance rating of 1 on each criteria*	30
• inspect and service ride and control systems	• observed performance in inspecting/servicing suspension, steering and brake systems including the following: – labelling and checking parts subject to wear – inspecting and repacking a wheel bearing – identifying tire wear problems. *Assessment Tool* *Ride and Control Systems: Part 3, MEC113–1* *Standard* *Performance rating of 1 on each criteria*	60

MODULE MEC115: RIDE AND CONTROL SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • demonstrate basic competencies.	*Assessment of student achievement will be based on:* • observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow established safety procedures.	
Identify/Function	• locate and identify the components that are used to provide: – stopping action – directional control – rolling action and traction – stabilization – cushioning – other • describe methods of directional control • describe the method of steering used by most wheeled vehicles • examine and explain the purpose of the parts of a conventional steering system; e.g., steering gear, tie rod end, idler arm, pitman arm and steering knuckle • list the parts of a steering system that are subject to wearing or bending • inspect and repack wheel bearing.	Airplanes, tracked.

MODULE MEC115: RIDE AND CONTROL SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • identify and describe the action of the following types of braking systems and possible application: – mechanical – hydraulic – electric – air – other • explain the difference between the braking action of a disc and drum brake • determine how tires and tracks vary according to: – road or terrain use – seasonal use – methods of construction • examine the wear pattern on a tire to determine whether it has been: – over or under inflated – improperly aligned – subject to suspension faults – balanced improperly.	The construction, highway, off-highway.
Identify/Service	• check and complete a tire repair • complete a tire balance • identify tire wear problems • inspect and repack wheel bearing • list and identify the parts of a braking system that are subject to wearing, seizing or leaking.	

MODULE MEC116: VEHICLE STRUCTURES AND MATERIALS

Level: **Introductory**

Theme: **Suspension and Structural Systems**

Prerequisite: **None**

Module Parameters: **Access to vehicle, hand tools, fasteners, materials and related resources**

Students identify the types of materials and components that are used in a vehicle's construction.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate the safe use of tools and follow established lab procedures	• observed performance related to: – following lab/shop established routines – recognition of health hazards and safety procedures associated with coated surfaces – how hazardous materials are handled and disposed of safely. *Assessment Tool* *Vehicle Structures and Materials: Part 1, MEC116–1* *Standard* *Performance rating of 2 on each criteria*	10
• determine the relationship between the function of a vehicle and the materials used in its construction	• report indicating how function of a vehicle dictates construction material in interior and exterior components: – listing types of materials, fasteners and coatings. *Assessment Tool* *Vehicle Structures and Materials: Part 2, MEC116–1* *Standard* *Performance rating of 1 on each criteria*	30

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • examine and identify the basic parts and materials used in the construction of a vehicle	*Assessment of student achievement will be based on:* • observed performance in identification of vehicle structures parts and materials. *Assessment Tool* *Vehicle Structures and Materials: Part 3, MEC116–1* *Standard* *Performance rating of 1 on each criteria*	60
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • state health and environmental issues related to the replacement and repair of coated surfaces • state how hazardous materials are handled and disposed of.	
Consumer Awareness	• determine what parts of a vehicle are recyclable • cite examples of initiatives that will increase the percentage of parts that can be recycled • trace the historical development of materials used in transportation vehicles • list ways government regulations have altered the design and construction of vehicles	
Identify/Function	• identify and discuss the factors that have contributed to the use and development of new structural materials.	

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • identify the monoliths and composite materials used in a modern vehicle • determine the most appropriate methods of identifying the type of materials used in a part or structure • examine and describe the action of a coil spring when subject to rapid loading • identify the factors used to select a material for a given function • indicate how design and construction of a vehicle is affected by the media (land, sea, air, space) that it operates in • identify design features that are tied more closely to consumer taste than function • examine a vehicle and describe what steps have been taken to: – reduce its weight – reduce drag – increase passenger safety – increase longevity of structural parts – improve passenger comfort and space • know common types of fasteners used, such as: – studs, bolts, screws – nuts – rivets – clips – clamps • identify what structural coatings are used to: – protect against corrosion – add to the appearance – reduce effects of the sun's radiation – reduce noise.	This module could be a vehicle dismantling project—group work possibilities. *Highway Traffic Act.*
Careers	• explore further education, work conditions and opportunities.	

Concept	Specific Learner Expectations	Notes
Career Exploration	*The student should:* • investigate growth occupations that are associated with transportation vehicles.	Designing, building, recycling.

MODULE MEC117: METAL FORMING AND FINISHING

Level: **Introductory**

Theme: **Suspension and Structural System**

Prerequisites: **Vehicle Structures and Materials (MEC116; recommended)**
Oxyacetylene Welding (FAB104; recommended)

Module Parameters: **Access to oxy-fuel welding equipment, basic autobody hand/power tools, basic metal refinishing material and resources**

Students create and form metal panels.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe practices when metal forming and finishing	• observed performance related to: – following established lab/shop procedures – safe use of tools/equipment related to metal forming and finishing – recognize and follow personal protective procedures. *Assessment Tool* *Metal Forming and Finishing: Part 1, MEC117–1* *Standard* *Performance rating of 2 on each criteria*	10
• research effects of distortion and corrosion on sheet metal	• report indicating effects of distortion and corrosion on ferrous sheet metal including: – characteristics of sheet metal – work hardening of sheet metal. *Assessment Tool* *Metal Forming and Finishing: Part 2, MEC117–1* *Standard* *Performance rating of 1 on each criteria*	20

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• repair minor damage in a panel	• observed performance in correcting: – minor dent and/or forming a crown in a panel – small rust out in a panel using welding procedures. *Assessment Tool* *Metal Forming and Finishing: Part 3, MEC117–1* *Standard* *Performance rating of 1 on each criteria*	70
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • demonstrate safe practices in relation to: – personal protective equipment/clothes – use impact tools, drills, grinders, cutters, sheet metal brake and shear – safely use oxy-acetylene/MIG welding equipment – hazards of body fillers.	
Identify/Analysis	• understand properties of: – low carbon steels – high strength steels • list tools and equipment available shaping sheet metal • identify the process required for specific types of shaping.	Types of steel; work hardening; affects of impact forces. Stretching, shrinking.

MODULE MEC117: METAL FORMING AND FINISHING (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analysis (continued)	*The student should:* • identify processes for metal working and repairing small dents.	Mild sheet metal distortion; pry bar, pulling tools; hammering techniques. Paintless dent repair.
	• describe possible methods of small rust out repair • determine the best method of small rust out repair • identify various plastic filler materials available • determine the suitable type of plastic fillers to be used • complete a small rust out repair.	Fibreglass, welded patches.
Inspect/Repair	• pick metal panel to smooth contour • file and grind panel to desired finish • complete operation by sanding • prepare the surface and fillers for application • apply plastic fillers and finish.	Fibreglass, aluminum, light/premium, polyester.
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC119: SURFACE PREPARATION I

Level: **Introductory**

Theme: **Suspension and Structural Systems**

Prerequisite: **None**

Module Parameters: **Access to painting facilities, surface preparation tools/materials and related resources**

Students assess the state of a surface and follow restoration procedures.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe practices when doing surface preparation	• observed performance related to: – following established lab/shop routines with respect to abrasive dust and chemical fumes – safe use of tools/equipment and use of hazardous materials – use of WHMIS bulletins. *Assessment Tool* *Surface Preparation: Part 1, MEC119–1* *Standard* *Performance rating of 2 on each criteria*	10
• identify products, equipment and procedures associated with surface preparation	• report indicating the following for surface preparation: – list of conditions and appropriate repair procedures – list of abrasives/alternatives and how they are used – list of tools/equipment required. *Assessment Tool* *Surface Preparation: Part 2, MEC119–1* *Standard* *Performance rating of 1 on each criteria*	30

MODULE MEC119: SURFACE PREPARATION I (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• analyze, prepare and perform a surface preparation	• performance in doing a surface preparation observing: – proper analysis – preparation of panel. *Assessment Tool* *Surface Preparation: Part 3, MEC119–1* *Standard* *Performance rating of 1 on each criteria*	60
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • demonstrate safe practices in relation to: – abrasive dust – chemicals/fumes.	Grinding, sandblasting; paint stripping; strippers. Potential health hazards.
Identify/Analysis	• determine problem conditions in painted surfaces • identify tools, equipment that must be used • list types of equipment/tools used in surface preparation processes • list types of abrasives used in surface preparation • identify alternative method of surface preparation; e.g., chemical stripping, blasting • know types, purpose and methods of applying undercoats • understand types and uses of putties. • identify methods of masking • list equipment used in masking	Paint oxidized, peeled, chips, rust, cracking. Masking tape, foam tape, liquid masking, paper types.

MODULE MEC119: SURFACE PREPARATION I (continued)

Concept	Specific Learner Expectations	Notes
Identify/Repair	*The student should:* • explain and demonstrate methods of sanding • identify condition and use appropriate methods of surface preparation • identify and apply metal conditioner • mask a number of different projects.	
Careers	• explore further education, work conditions and opportunities.	

MODULE CURRICULUM AND ASSESSMENT STANDARDS:

SECTION E: INTERMEDIATE LEVEL

The following pages define the curriculum and assessment standards for the intermediate level of Mechanics.

> Intermediate level modules help students build on the competencies developed at the introductory level and focus on developing more complex competencies. They provide a broader perspective, helping students recognize the wide range of related career opportunities available within the strand.

Module MEC201:	Vehicle Detailing	E.3
Module MEC202:	Vehicle Maintenance	E.7
Module MEC203:	Lubrication and Cooling Systems	E.13
Module MEC204:	Fuel and Exhaust Systems	E.17
Module MEC205:	Alternate Fuel Engines	E.21
Module MEC206:	Ignition Systems	E.23
Module MEC207:	Emission Controls	E.27
Module MEC209:	Electrical Components	E.31
Module MEC210:	Power Assist Accessories	E.35
Module MEC211:	Braking Systems	E.39
Module MEC212:	Hydraulic Accessories	E.43
Module MEC213:	Power Trains	E.47
Module MEC214:	Manual Transmissions and Transaxles	E.53
Module MEC215:	Suspension Systems	E.57
Module MEC216:	Steering Systems	E.61
Module MEC217:	Metal Repair and Finishing	E.65
Module MEC218:	Trim Removal and Installation	E.69
Module MEC219:	Surface Preparation II	E.73
Module MEC220:	Refinishing I	E.77
Module MEC221:	Basic Touch-up and Finishing	E.81
Module MEC222:	Interior Finishes and Repairs	E.85

MODULE MEC201: VEHICLE DETAILING

Level: **Intermediate**

Theme: **Vehicle Design and Ownership**

Prerequisite: None

Module Parameters: **Access to commercially available products and related resources**

Students develop the skills required to restore and enhance the exterior finishes of a vehicle.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• state personal and environmental hazards associated with the use of cleaning and waxing agents	• presentation of a report describing: – hazards associated with use of cleaning and waxing – environmental concerns in the use of cleaning agents – solutions to the described hazards. *Assessment Tool* *Vehicle Detailing: Part 1, MEC201–1* *Standard* *Performance rating of 2 on each criteria*	15
• describe materials available to enhance the appearance of a vehicle	• identification of materials and products used in the detailing of a vehicle by providing a list including: – surface enhancing material – trim additions. *Assessment Tool* *Vehicle Detailing: Part 2, MEC201–1* *Standard* *Performance rating of 2 on each criteria*	15
• demonstrate the correct cleaning and treatment of exterior finishes including paint, glass, vinyl and rubber body and engine parts	• observed performance in vehicle cleaning and enhancement on painted, glazed, vinyl, rubber including engine compartment surfaces. *Assessment Tool* *Vehicle Detailing: Part 3, MEC201–1* *Standard* *Performance rating of 2 on each criteria*	20

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • install a trim or accessory part according to standard practice	*Assessment of student achievement will be based on:* • observed performance in a trim installation including: – use of resources – use of tools and materials – identification of parts. *Standard* *Performance rating of 2 on each criteria* *Assessment Tool* *Vehicle Detailing: Part 4, MEC201–1*	50
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tools* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow safety rules and procedures in the handling of dangerous cleaning agents • demonstrate safe handling and application of volatile cleaners used for engine cleaning • follow procedures outlined to prevent damage to electrical or other parts when cleaning • identify hazards that are present, including acid powder	WHMIS. Preferred environmentally friendly products.
Identify/Analysis	• identify and practise the correct procedures when using cleaning and polishing/treatment agents on various materials • identify surface flaws and solutions that could be used other than spray painting • explain the value of using waxes to treat painted surfaces (including longevity and monetary)	Paintless dent repair.

MODULE MEC201: VEHICLE DETAILING (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analysis (continued)	*The student should:* • identify, through research, four or more kinds of clips, two-way tape and adhesive turn fasteners • list the precautions needed to prevent damage to trim or adjacent surfaces when removing and replacing trim parts • explain the value and methods used to enhance the appearance of a vehicle without painting.	Silicone-free products.
Inspect/Repair	• learn, through practice, the procedures used to remove and replace trim parts, the correct use of tools involved, and the value of these parts • demonstrate the application of decals, pin striping and/or molding as a method of enhancing vehicle appearance • demonstrate the ability to follow installation instructions by completing an accessory installation project • use materials available to complete an engine clean and, if possible, install enhancing materials such as paints or coatings • describe the value of maintaining a clean and neat engine area.	
Careers	• identify further education, work conditions and opportunities related to vehicle detailing.	

MODULE MEC202: VEHICLE MAINTENANCE

Level: **Intermediate**

Theme: **Vehicle Design and Ownership**

Prerequisite: **Vehicle Service and Care (MEC102; recommended)**

Module Parameters: **Access to vehicles, specialty tools, hand tools and related resources**

Instructional Qualification: Client work to be checked by certified technician when work performed on brakes, steering and suspension

Students execute basic service requirements necessary to ensure the adequate maintenance of a motor vehicle.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established safety procedures and care when working with vehicles	• observed performance in: – following established lab/shop routines – use of WHMIS information as it applies to oil, grease, gasoline and antifreeze – working with others – proper and safe use of tools/equipment. *Assessment Tool* *Vehicle Service/Maintenance: Part 1, MEC102/202–1* *Standard* *Performance rating of 2 on each criteria*	15
• identify service requirement of a vehicle as per manufacturer's recommendations	• given a vehicle, generate a service schedule indicating: – make, model, year and serial number – system or unit to be checked, serviced or replaced – time, mileage, service condition. *Assessment Tool* *Vehicle Service/Maintenance: Part 2, MEC102/202–1* *Standard* *Performance rating of 2 on each criteria*	15

MODULE MEC202: VEHICLE MAINTENANCE (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• conduct a motor vehicle inspection in keeping with the age of the vehicle, distance traveled, service conditions and history	• observed performance: – completeness of inspection according to generated schedule – inspecting engine cooling, fuel, exhaust, ignition emission, lubrication and mechanical system – inspecting power train, running gear and body. *Assessment Tool* *Vehicle Service/Maintenance: Part 3, MEC102/202–1* *Standard* *Performance rating of 2 on each criteria*	25
• service and repair a motor vehicle according to the vehicle condition and service schedule	• observed performance in servicing a given vehicle according to the schedule. *Assessment Tool* *Vehicle Service/Maintenance: Part 4, MEC102/202–1* *Standard* *Performance rating of 2 on each criteria*	45
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures.	WHMIS and school district's guidelines.
Identify/Analysis	• identify the service requirements for a specific motor vehicle considering the odometer reading, conditions of operation and service history.	

Concept	Specific Learner Expectations	Notes
Identify/Analysis (continued)	*The student should:* • determine condition of the camshaft timing belt or chain and recommend the appropriate service • assess brake system fluid integrity and brake pedal feel relative to repair requirements.	Compare with manufacturer's specifications.
Inspect/Service	• inspect engine for oil leaks • renew engine gaskets or seals, where necessary • change engine oil and filter • service PCV valve and breather • inspect the condition of coolant, hoses, belts, fan and radiator; adjust belts if required • change or recondition the engine coolant and flush the cooling system, if required • pressure test the system • replace the thermostat, if necessary • locate and inspect the fuel filter; replace if required • replace the air filter, if required • inspect and service throttle linkage • inspect manifolds, pipes, catalytic converter, muffler and hangers for structural integrity; repair as required • inspect and either service or replace as required by the service schedule: – spark plugs – distributor cap and rotor – spark plug wires and boots • inspect and replace fuel purge canister filter, if required	Optional. Optional. Optional.

Concept	Specific Learner Expectations	Notes
Inspect/Service (continued)	*The student should:* • inspect and replace fluids as required in the following components: – automatic transmission – manual transmission – transaxle – transfer case – differential assembly • inspect and recommend service for constant velocity joints, seals, drive shaft, drive axles and U-joints • investigate tire condition and relate condition to probable cause and replacement necessity • mount and balance tires • rotate tires to maximize wear life • inspect and assess the service condition of steering and suspension system components • inspect and repack wheel bearing • lubricate steering and suspension system joints • recommend further service requirements of the system • replenish fluids in hydraulic pump • inspect and assess the wear characteristics of disc brake and drum brake components • lubricate parking brake linkages • top up brake fluid reservoir • inspect and service battery and battery clamps, renew clamps if required • adjust alternator belt tension if necessary • check the operation of all lights and replace required bulbs • inspect fuse panel and renew inoperative fuses	Jacking/hoisting systems. Hazards when working with lead-acid storage batteries.

MODULE MEC202: VEHICLE MAINTENANCE (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Service (continued)	*The student should:* • using a voltmeter, test the alternator charging voltage • recommend further repair requirements • lubricate hinges on all opening panels and weather strips • lubricate locks or lock plates, as required • inspect and change windshield wiper blades, if necessary • inspect for loose trim or moldings.	Good resource: vehicle write-off inspection form for total module.
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC203: LUBRICATION AND COOLING SYSTEMS

Level: **Intermediate**

Theme: **Propulsion Systems**

Prerequisite: **Engine Fundamentals (MEC104; recommended)**

Module Parameters: **Access to pressure tester, hand tools and related resources**

Students diagnose, maintain and service the lubrication and cooling systems on a typical four-cycle gasoline engine.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • demonstrate safe procedures associated with vehicle engine fluids	*Assessment of student achievement will be based on:* • observed performance related to: – appropriate selection of personal and vehicle protective equipment when working with oils, flushes and antifreeze – maintains an organized workplace – maintains a tidy workplace – uses correct tools and materials in a safe and efficient manner – uses appropriate fluids for oil changes/cooling systems – ensures used fluids are placed in appropriate containers and disposed *Assessment Tool* *Lubrication and Cooling Systems: Part 1, MEC203–1* *Standard* *Performance rating of 2 on each criteria*	10
• identify components and describe engine cooling/ lubrication system function and operation	• observed performance related to: – identification of components description of engine cooling/lubrication system function and operation, including: • selection and use of resources including service manuals • properties of coolants and lubricating oils. *Assessment Tool* *Lubrication and Cooling Systems: Part 2, MEC203–1* *Standard* *Performance rating of 2 on each criteria*	35

MODULE MEC203: LUBRICATION AND COOLING SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• diagnose and correct lubrication and cooling system problems	• performance in diagnosing and repairing lubrication and cooling system faults. *Assessment Tool* *Lubrication and Cooling Systems: Part 3, MEC203–1* *Standard* *Performance rating of 2 on each criteria*	55
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow all safety procedures associated with hot fluids and fluids under pressure • collect and dispose of all hazardous fluids in the appropriate manner • remove all spills from work area.	WHMIS materials. To environmental standards.
Identify/Function	• identify the multiple tasks performed by the lubrication system • determine the properties of an engine lubricant intended for use in a late model engine • interpret the meaning of the American Petroleum Institute (API) symbol and viscosity numbers used on oil containers • observe the design and operation of a: – gear and rotor-type oil pump – pressure regulator or relief valve – oil pressure sensor gauge or indicator – oil level and change indicator	

Concept	Specific Learner Expectations	Notes
Identify/Functions (continued)	*The student should:* • identify possible cause of low/high oil pressure and high levels of oil consumption under normal operating conditions • explain the function of the cooling system • determine the relationship between the percentage of antifreeze and water to the coolant's freezing and boiling points • establish the most appropriate percentage to meet local conditions • observe the design and operation of a: – radiator and cap – fan – thermostat – hoses – water pump – recovery tank – radiator – block heater • identify possible causes for engine overheating or running cold under normal operating conditions	Sample pumps. Fan direct clutch and electric. If activities are not done on live units, have students perform them on shop units.
Inspect/Service	• inspect engine for oil leaks owing to gasket/seal failure • replace seal/gaskets if necessary • disassemble and inspect a gear or rotor pump for pitting and galling or abnormal wear • test oil pressure sensor; replace if necessary • inspect hoses for cracks, soft spots and leaks; replace if necessary • test thermostat; replace if necessary • inspect water pump for leaks and bearing condition • inspect fan • inspect radiator for leaks, blockages; replace if necessary • check condition and tension of fan belt; replace if necessary.	

MODULE MEC203: LUBRICATION AND COOLING SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Career Opportunities	*The student should:* • identify further education and work opportunities related to aftermarket parts supply and rebuilding.	

MODULE MEC204: FUEL AND EXHAUST SYSTEMS

Level: **Intermediate**

Theme: **Propulsion Systems**

Prerequisite: **Engine Fundamentals (MEC104; recommended)**

Module Parameters: **Access to ventilated area, fuel pump vacuum/pressure tester and related resources**

Students diagnose, maintain and service the fuel and exhaust system on a typical four-cycle gasoline engine.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe habits associated with volatile liquids and combustion gases	• observed performance related to – following shop routines and precautions – following safe practices and proper use of containers, safety devices, tools and equipment while working on fuel and exhaust systems – proper use of fire extinguishers, containers, measuring devices, pressure meters and related tools and equipment. *Assessment Tool* *Fuel and Exhaust Systems: Part 1, MEC204–1* *Standard* *Performance rating of 2 on each criteria*	10
• identify components and describe engine fuel and exhaust system function and operation	• listing components and describing system function and operation for fuel and exhaust system • description of the importance and effects of air fuel ratio to correct combustion – describe the symptoms associated with a rich mixture–lean mixture – discuss air flow, atomizing pre- and post-ignition • explanation of exhaust system performance *Assessment Tool* *Fuel and Exhaust Systems: Part 2, MEC204–1* *Standard* *Performance rating of 2 on each criteria*	25

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • diagnose and correct fuel and exhaust system faults	*Assessment of student achievement will be based on:* • observed performance related to: – use of service manuals and related resources – diagnosing fuel and exhaust system faults – servicing/repairing fuel and exhaust systems. *Assessment Tool* *Fuel and Exhaust Systems: Part 3, MEC204–1* *Standard* *Performance rating of at least 2 on each criteria*	65
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow all safety procedures associated with volatile liquids and exhaust gases • store fuels and solvents in the appropriate manner • maintain proper venting and air supply in the work area.	Gasoline spills, carbon monoxide dangers.
Identify/Function	• describe the chemical composition of gasoline and the effect complete and incomplete combustion have on the environment and engine performance • determine the characteristics of a quality gasoline in relation to its volatility and octane rating • identify measures that are taken to: – prevent the formation of gum deposits – prevent the oxidation of metal parts – retard icing – aid in the identification of fuel types and grades	

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • determine the factors that affect combustion, such as: – spark plug location – combustion chamber size and shape – compression ratio – valve and part design – spark timing, duration and intensity – air temperature and fuel ratio – manifold pressures – valve timing, life and duration • identify and describe the function of the major fuel system components • explain the difference between a carburetor and a fuel injected system • identify the common problems associated with carburetors and fuel injected systems • locate and describe the function of the major exhaust system components.	Effect of a blocked exhaust system
Inspect/Service	• clean and adjust a typical carburetor on and off an engine • visually inspect and test a typical fuel injection system • test fuel pump pressure and capacity; repair or replace if necessary • visually inspect and test for exhaust leaks or blockages; replace converters, pipes, mufflers if necessary.	
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC205: ALTERNATE FUEL ENGINES

Level: **Intermediate**

Theme: **Propulsion Systems**

Prerequisite: **Engine Fundamentals (MEC104; recommended)**

Module Parameters: **Access to related resources, basic hand tools**

Students explore the use of alternate fuels used to power motor vehicles.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safety relative to alternate fuel vehicles	• observed performance related to: – appropriate personal and vehicle safety procedures when starting, stopping, parking and refueling alternate fuel vehicles – safe storage of alternate fuels. *Assessment Tool* *Alternate Fuel Engines: Part 1, MEC205–1* *Standard* *Performance rating of 2 on each criteria*	20
• determine the type of fuel that is best suited to a particular type of vehicle and application	• ability to identify alternate fuels which are best suited to particular tasks and requirements. *Assessment Tool* *Alternate Fuel Engines: Part 2, MEC205–1* *Standard* *Performance rating of 2 on each criteria*	35
• service an alternate fueled vehicle, recognizing its unique maintenance requirements	• performance in servicing an alternate fueled vehicle. *Assessment Tool* *Alternate Fuel Engines: Part 3, MEC205–1* *Standard* *Performance rating of 2 on each criteria*	45
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

MODULE MEC205: ALTERNATE FUEL ENGINES (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures • state how alternate fuels affect the environment.	Dangers involved in working on vehicles using, e.g., propane, natural gas.
Identify/Function	• identify the typical alternate fuels; e.g., – diesel – propane – methanol – natural gas – hydrogen • compare the heat-producing characteristics of each fuel • identify resources and methods of marketing different types of fuel • identify warp in which fuels are stored • describe the engine design modifications that are required to operate on: – diesel – propane – methanol – others.	BTU charts from oil companies. Bulk and vehicle storage.
Application	• determine the advantages of using an alternate fuel by considering: – fuel cost – availability – performance – engine life – environmental impact.	
Inspect/Service	• determine the specific service requirement for an alternate fuel engine • complete a service and maintenance task according to the manufacturer's recommendations; e.g., change fuel filter, engine lubricant and oil filter.	
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC206: IGNITION SYSTEMS

Level: **Intermediate**

Theme: **Propulsion Systems**

Prerequisite: **Electrical Fundamentals (MEC109; recommended)**

Module Parameters: **Access to multimeter, timing light, hand tools and related resources**

Students become familiar with the basic components and parts of ignition systems used on internal combustion engines.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• interpret and apply instruction manuals and follow electrical safety guidelines	• observation based on: – selection and use of resources and materials – understanding dangers of high voltages and high currents. *Assessment Tool* *Ignition Systems: Part 1, MEC205–1* *Standard* *Performance rating of at least 2 on each criteria*	10
• explain how a timed high voltage spark is achieved in a magneto, point and electronic ignition systems	• ability to explain how the parts of magneto, point and electronic ignition systems interrelate to produce timed ignition spark. *Assessment Tool* *Ignition Systems: Part 2, MEC205–1* *Standard* *Performance rating of 2 on each criteria*	20
• recognize the driving symptoms and use visual and instrument checks to diagnose ignition system faults	• observation based on – ability to do visual tests in order to diagnose ignition faults – ability to use instruments to diagnose faults – ability to analyze drivability symptoms. *Assessment Tool* *Ignition Systems: Part 3, MEC205–1* *Standard* *Performance rating of 2 on each criteria*	30

MODULE MEC206: IGNITION SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• service and repair ignition system	• observed performance in: – servicing point ignition system – servicing electronic ignition system – correcting a defective system. *Assessment Tool* *Ignition Systems: Part 3, MEC205–1* *Standard* *Performance rating of 3 on each criteria*	40
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures • observe hazards involved when working with high voltages and currents.	Shocks, burns.
Identify/Function	• list and describe the three common types of ignition systems • name the parts of a: – magneto – point type – electronic ignition system – DIS.	Distributor-less ignition.

MODULE MEC206: IGNITION SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • recognize and describe symptoms produced by a typical part failure; e.g., – loose connection – faulty spark plug – faulty spark plug or coil wire – bad distributor cap or rotor – faulty points – faulty coil – other.	
Inspect/Service	• test the following: – primary circuit voltage drop – high tension lead resistance – ignition coil – ignition cap – distributor points and condensor – advance mechanisms • remove and analyze a spark plug to determine how well the engine is operating; e.g., oil consumption, fuel/air ratio and determine service/ repair required • lubricate distributor • clean and tighten electrical leads and connections • complete the following according to the manufacturer's specifications: – clean gap and/or replace with new spark plugs – clean and/or replace with new contact points – adjust contact points and pick up coil gap – adjust/repair advance mechanisms – set ignition timing statically and check with a timing light.	
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC207: EMISSION CONTROLS

Level: **Intermediate**

Theme: **Propulsion Systems**

Prerequisites: **Engine Fundamentals (MEC104)**
Lubrication and Cooling Systems (MEC203)
Fuel and Exhaust Systems (MEC204)
Ignition Systems (MEC206; recommended)

Module Parameters: **Access to optional specialized equipment and related resources**

Students gain an understanding of the importance of controlling emissions and the technology applied to vehicles in order to meet prescribed standards.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safety procedures relative to emission control system	• observed performance related to: – safety procedures in use of tools and equipment related to vehicle emissions – appropriate selection of and use of protective equipment – understanding the hazards of vehicle emissions. *Assessment Tool* *Emission Controls: Part 1, MEC207–1* *Standard* *Performance rating of 2 on each criteria*	10
• list and explain vehicle pollutants and the effects on the environment	• observed performance based on: – listing vehicle emissions – explaining exhaust emissions and their effects on the environment – stating regulations pertaining to exhaust emission levels – comparing emissions produced by gasoline as compared to alternate fuels. *Assessment Tool* *Emission Controls: Part 2, MEC207–1* *Standard* *Performance rating of 2 on each criteria*	15

MODULE MEC207: EMISSION CONTROLS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• understand types and characteristics of pre- and post-combustion emission systems	• ability to describe and demonstrate – types of pre- and post-combustion emission control systems – identify parts of pre- and post-combustion emission systems – describe the function and operation of pre- and post-combustion emission systems. *Assessment Tool* *Emission Controls: Part 3, MEC207–1* *Standard* *Performance rating of 2 on each criteria*	15
• identify components that control emissions	• observed performance based on: – locating and identifying components on a vehicle – describing how components work together to reduce emissions – evaluating a given system for completeness. *Assessment Tool* *Emission Controls: Part 4, MEC207–1* *Standard* *Performance rating of 2 on each criteria*	25
• diagnose and service emission control system	• observed performance based on: – connection of a gas analyzer to a vehicle – reading and recording the exhaust emissions – company recorded emission to manufacturers specification and analyze how well emission system functions – servicing emission control systems. *Assessment Tool* *Emission Controls: Part 5, MEC207–1* *Standard* *Performance rating of 2 on each criteria*	35
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

MODULE MEC207: EMISSION CONTROLS (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures. • describe effect of vehicle emissions on the environment and specifically on human life.	Smog effects. Carbon monoxide effects.
Identify/Function	• list types and where vehicle pollutants are created • explain how these pollutants are created • research regulations that dictate maximum pollutant levels • identify and understand the operation of the following pre-combustion control systems: – crankcase ventilation system – exhaust gas recirculation system – ignition spark control systems – computerized engine controls – evaporative control systems – engine design modifications; i.e., combustion chamber, piston, cylinder head, manifold and air induction design • identify and understand the operation of the following post-combustion control systems on several different types of vehicles: – air injection system – air aspirator system – catalytic converters	

Concept	Specific Learner Expectations	Notes
Inspect/Service	*The student should:* • check and service positive crankcase ventilation system • check and service evaporative control system • check and service air injector system • check and service exhaust gas recirculation system • check catalytic converter • check and adjust spark control system • check computerized engine controls • using exhaust gas analyzer (if available), check emissions for a given vehicle.	As per manufacturer's specifications.

MODULE MEC209: ELECTRICAL COMPONENTS

Level: **Intermediate**

Theme: **Guidance and Control Systems**

Prerequisite: **Electrical Fundamentals (MEC109) recommended**

Module Parameters: Volmeter, Ohmmeter, ammeter, alternator, starter and related resources.

Students become familiar with the basic use and testing of electrical components used in a typical motor vehicle.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• follow safety guidelines and standards when working with electrical components	• observed performance in demonstrating – following shop electrical routines – avoidance of electrical conditions such as grounds, shorts, sparks – observing proper polarity. *Assessment Tool* *Electrical Components: Part 1, MEC209–1* *Standard* *Performance rating of 2 on each criteria*	10
• describe the function and operation of electrical systems and components	• report providing the following – list and function of vehicle electrical systems – list of electrical components in each system – operation of electrical systems. *Assessment Tool* *Electrical Components: Part 2, MEC209–1* *Standard* *Performance rating of 2 on each criteria*	15

MODULE MEC209: ELECTRICAL COMPONENTS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• identify electrical faults through the use of standard diagnostic and testing procedures	• observed performance in: – use of voltmeter, ohmmeter and ammeter – testing for open and closed circuits – testing for load voltage and voltage drop – testing for current draw – testing for resistances – recognizing abnormal electrical circuit conditions. *Assessment Tool* *Electrical Components: Part 3, MEC209–1* *Standard* *Performance rating of 2 on each criteria*	25
• test and service electrical components	• observed performance in testing and overhaul of: – starter motor assembly – alternator assembly – testing assembled starter/alternator. *Assessment Tool* *Electrical Components: Part 4, MEC209–1* *Standard* *Performance rating of 2 on each criteria*	50
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
	The student should:	
Health/Safety Hazards	• follow lab safety procedures with respect to electrical hazards, such as: – electrical shocks – electrical burns • know how to avoid sparks and grounding • observe electrical polarity.	Dangers of wearing jewellery.

MODULE MEC209: ELECTRICAL COMPONENTS (continued)

Concept	Specific Learner Expectations	Notes
System/Component Function	*The student should:* • locate the major electrical/electronic systems in a motor vehicle: lighting, charging and starting • explain the operation and function of each of the electrical/electronic systems • show how electrical/electronic systems interact with other vehicle systems; e.g., suspension and braking systems • for charging, starting and lighting systems, identify and explain the purpose and their basic component parts • recognize and draw the symbols for common electrical components • identify and describe the ratings that are given to electrical components; e.g., resistance, voltage, amperage and power rating.	Draw block diagrams.
Identify/Function	• identify and describe the functions of a: – voltmeter – ohmmeter – ammeter – multimeter – load tester – tack dwell meter – growler • calibrate correctly, connect accurately and read the appropriate test equipment to determine: – open and closed circuit – load voltage and drop – current draw – component resistance.	
Inspect/Repair	• identify and correct faults associated with electrical components and instruments • overhaul a starter motor assembly • overhaul an alternator.	

MODULE MEC210: POWER ASSIST ACCESSORIES

Level: **Intermediate**

Theme: **Guidance and Control Systems**

Prerequisites: **Electrical Fundamentals (MEC109; recommended)**
Pneumatic and Hydraulic Systems (MEC111)

Module Parameters: **Multimeter, power accessories and related resources**

Instructional Qualification: Client work must be checked by certified technician

Students study and identify the functions and associated parts of power assist accessories.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established procedures of care and safety when working on power accessories	• observed performance based on: – personal care safety when working with power accessories – vehicle care and safety when working with power accessories – maintenance of a clean and organized workplace – safe and efficient use of tools and equipment *Assessment Tool* *Power Assist Accessories: Part 1, MEC210–1* *Standard* *Performance rating of 2 on each criteria*	15
• list components and state the function of power assist accessories	• performance as measured by: – a comprehensive list of available power assist accessories – listing components in power assist systems – demonstrating an understanding of power accessories that have been used to replace mechanical accessories showing how mechanical work can be performed by power assist accessories. *Assessment Tool* *Power Assist Accessories: Part 2, MEC210–1* *Standard* *Performance rating of 2 on each criteria*	20

MODULE MEC210: POWER ASSIST ACCESSORIES (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• describe and check the major components of power accessories	• performance in describing and checking major power assist accessories: – descriptions of major components stating the type of energy used – description of the major components including mechanical and electrical principles – checking whether accessories performs their function. *Assessment Tool* *Power Assist Accessories: Part 3, MEC210–1* *Standard* *Performance rating of 2 on each criteria*	25
• service and repair power accessories	• observed performance related to: – following procedures to isolate and identify faulty components/system – servicing and repairing faulty power assist accessories – test to establish that the fault has been remedied – analysis of possible factors that caused the failure in the component. *Assessment Tool* *Power Assist Accessories: Part 4, MEC210–1* *Standard* *Performance rating of 2 on each criteria*	40
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

MODULE MEC210: POWER ASSIST ACCESSORIES (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • demonstrate established lab safety procedure • follow practices that prevent damage to components.	
Identify/Function	• describe the types and basic functions of power accessories found on vehicles • compare power accessories to the mechanical system they have replaced • evaluate current power accessories as a means of forecasting types of power accessories that may be used in future vehicles.	Steering, brakes, suspension, windows, door locks, antennae.
System/Component Function	• list the parts of selected power accessories • describe the function of the major parts of selected power accessories • trace the power path of selected power accessories.	
Inspect/Repair	• consult shop manuals for diagnostics pertaining to specific power accessories • identify problems and faults in power accessories systems.	All services, diagnoses, repairs and replacements of parts must be checked by a licensed technician.

MODULE MEC211: BRAKING SYSTEMS

Level: **Intermediate**

Theme: **Guidance and Control Systems**

Prerequisite: **Pneumatic and Hydraulic Systems (MEC111)**

Module Parameters: **Access to specialized brake tools and related resources**

Instructional Qualification: Client work must be supervised by certified technician

Students develop the necessary knowledge, skills and attitudes to diagnose, service and maintain a braking system according to accepted trade practice.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safety procedures when working on brakes	• measured performance related to: – appropriate selection and use of protective supplies and equipment for personal safety – knowing safety implications when working on vehicle brakes – safe practices when handling asbestos. *Assessment Tool* *Braking Systems: Part 1, MEC211–1* *Standard* *Performance rating of 2 on each criteria*	10
• identify brake design and components, and state their application	• performance measured by: – identification and description of brake components – understanding of the application of braking components and their function. *Assessment Tool* *Braking Systems: Part 2, MEC211–1* *Standard* *Performance rating of 2 on each criteria*	15

MODULE MEC211: BRAKING SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• analyze disc and drum brake systems	• observed performance related to: – listing factors/symptoms of worn or defective brake parts – visual recognition of worn or defective brake parts – use of tools/equipment to determine worn or defective brake parts. *Assessment Tool* *Braking Systems: Part 3, MEC211–1* *Standard* *Performance rating of 2 on each criteria*	15
• service disc and drum brake systems	• observed performance related to: – replacing brake shoes – replacing disc pads – resurfacing disc rotor and brake drum – remove and install/repair master cylinder, wheel cylinder, brake line/hoses – bleed brake system – adjust and service emergency brake. *Assessment Tool* *Braking Systems: Part 4, MEC211–1* *Standard* *Performance rating of 2 on each criteria* *Illustrative example MEC211–2 Braking System*	50
• interpret parts and service manuals and perform routine braking system service and maintenance	• observed performance related to: – use of service manuals and parts manuals – application of information to the routine service of braking systems. *Assessment Tool* *Braking Systems: Part 5, MEC211–1* *Standard* *Performance rating of 2 on each criteria*	10
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

MODULE MEC211: BRAKING SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures.	Asbestos hazards. Brake fluid effect on painted surface.
Identify/Function	• identify the parts of a hydraulic brake drum system • compare the operating principles of duo-servo and non-servo brake systems • identify the parts of a disc brake system • compare the operating principles of a fixed, floating and sliding caliper braking system • describe operation of a combined disc and drum system • identify the parts of an emergency brake system • compare the operating principles of an emergency brake system on disc and drum brake applications.	Valves involved.
Inspect/Service	• write up a work order, using appropriate questioning to determine brake problem • check a master cylinder fluid level • inspect drum and disc brake linings for wear • inspect drum and rotor for service • adjust an emergency brake cable.	
Inspect/Repair	• machine a brake drum and rotor according to the manufacturer's specifications • remove and replace disc and drum brake shoes • remove/replace and overhaul master cylinder, wheel cylinder and caliper • replace a flexible brake hose • bleed and flush a brake system.	Be familiar with internal components and rebuilding procedures. On road-licensed vehicle, have final inspection done by certified personnel.

MODULE MEC211: BRAKING SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Careers	*The student should:* • explore further education, work conditions and opportunities.	

MODULE MEC212: HYDRAULIC ACCESSORIES

Level: **Intermediate**

Theme: **Guidance and Control Systems**

Prerequisite: **Pneumatic and Hydraulic Systems (MEC111; recommended)**

Module Parameters: **Access to basic hand tools hydraulic systems and related resources**

Students develop a basic knowledge of hydraulic components, applications and servicing techniques.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safety procedures when working in hydraulic systems	• measured performance related to: – hazards associated with pressurized hydraulics – safe use of tools, equipment and materials – safe use of personal protective equipment – correct use of equipment used on vehicles. *Assessment Tool* *Hydraulic Accessories: Part 1, MEC212–1* *Standard* *Performance rating of 2 on each criteria*	10
• develop a basic understanding of the function of hydraulic components in a hydraulic system	• observed performance related to: – the location and function of hydraulic components – use of hydraulic resources. *Assessment Tool* *Hydraulic Accessories: Part 2, MEC212–1* *Standard* *Performance rating of 2 on each criteria*	15
• interpret parts and service manuals to provide the appropriate maintenance and service procedures of a hydraulic system	• observed performance related to: – listing appropriate procedures and techniques on servicing hydraulic components – developing a service schedule for a given application – use of resources. *Assessment Tool* *Hydraulic Accessories: Part 3, MEC212–1* *Standard* *Performance rating of 2 on each criteria*	50

MODULE MEC212: HYDRAULIC ACCESSORIES (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• service hydraulic components	• given a hydraulic system, servicing individual components. *Assessment Tool* *Hydraulic Accessories: Part 4, MEC212–1* *Standard* *Performance rating of 2 on each criteria*	25
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures • explain hazards associated with pressurized hydraulic systems.	
Identify/Analysis	• determine the properties of hydraulic fluids in relation to: – viscosity – lubricating ability – resistance to oxidation – corrosion prevention • identify the common types of connecting lines/hoses, fitting and seals • describe the internal parts of a reservoir and state the purpose of filters, strainers and breathers • investigate the construction and operation of: – cylinder – gear and vane motors.	

MODULE MEC212: HYDRAULIC ACCESSORIES (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analysis (continued)	*The student should:* • determine the function of: – check and pressure control valves – two- and four-way valves • investigate the construction and operation of gear, vane and piston pumps • determine why and when accumulators are used in a hydraulic system.	
Inspect/Service	• check fluid levels in reservoirs • clean strainers • replace system filters with the approved parts • check seals for leaks and replace • replace a defective hose, line and fitting • replace the hydraulic fluid in a system.	
Careers	• explore further education, work conditions and opportunities.	

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MODULE MEC213: POWER TRAINS

Level: **Intermediate**

Theme: **Guidance and Control Systems**

Prerequisite: **Mechanical Systems (MEC113; recommended)**

Module Parameters: **Access to, power train units, hand tools, specialized power train tools and related resources**

Students develop their understanding of the purpose, operation and servicing of a vehicle power train.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established safety procedures and care when working with vehicles	• observed performance related to: – safe practices using equipment, tools and materials – safe procedures when working with vehicle power train parts and components – recognizing back problems associated with lifting. *Assessment Tool* *Power Trains: Part 1, MEC213–1* *Standard* *Performance rating of 2 on each criteria*	10
• identify the purpose and describe the function of the major power train components	• measured performance related to: – identification of major power train components and their purpose – description and understanding of the inter-relationship between major components – developing a service schedule for power train components. *Assessment Tool* *Power Trains: Part 2, MEC213–1* *Standard* *Performance rating of 2 on each criteria*	20

MODULE MEC213: POWER TRAINS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• execute inspection, diagnostic, service and repair procedures on specific drive train components	• observed performance related to: – inspection and diagnosis of power train components: clutch, manual transmission, automatic transmission drive axles/shaft, and differential – service of power train components – removal/replacement of power train components. *Assessment Tool* *Power Trains: Part 3, MEC213–1* *Standard* *Performance rating of 2 on each criteria*	50
• identify work-related opportunities in this specialized area of vehicle repair	• observed performance related to: – reporting up-to-date information concerning opportunities in the power train area. *Assessment Tool* *Assessment Guide: Career Profile, MECCP–1* *Standard* *Performance rating of at least 2 on each criteria*	20
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures • recognize potential back problems associated with lifting heavy objects.	

Concept	Specific Learner Expectations	Notes
Identify/Function	*The student should:* • state the overall purpose of the power transmission system in a vehicle relating it to speed, torque, economy and weight or load • name the component assemblies of a power train on a given vehicle and describe the contribution each makes to the identified purpose • differentiate between the following power trains: – front wheel drive – rear wheel drive – four wheel drive • front–rear • rear–front – all wheel drive.	
Inspect/Service and Repair	• check fluid levels • develop a service schedule to include fluid change interval and type • removal and install power train components • service an automatic transmission by replacing the fluid, filter and oil pan gasket • check an assembly for leakage and replace the required seal(s) if possible, or recommend the repair requirement • check and adjust clutch linkage for correct free play or check operation of automatic adjuster if so equipped • assess clutch serviceability • determine the required fluid types as well as the fluid changing interval, using a service publication • check the gear box fluid level and replenish or replace as necessary, considering the service requirement characteristics of the vehicle	

Concept	Specific Learner Expectations	Notes
Inspect/Service and Repair (continued)	*The student should:* • check the assembly for leaks and replace the required seal(s) if possible, or recommend the repair requirement • adjust shifting linkages • inspect the drive shaft or drive axles for repair requirements such as: – worn U-joints or CV joints – broken grease seals/straps – structural damage • repair the coupling joint or shaft as required to return it to serviceability according to manufacturer's specifications • inspect transfer case fluid level and replenish or replace as required by service schedule • check linkage operation and adjust or repair as required to ensure serviceability • assess the operation of the assembly and repair, or recommend repair requirement • inspect the assembly for leaks and replace the required seal(s), or recommend the repair requirement • locate and inspect the couplings if the vehicle is so equipped • repair or recommend the required repair • check differential fluid and either replenish or replace as necessary, considering the vehicle's operating conditions and service interval scheduling specifications • remove a differential cover and identify the parts enclosed, or if not an integral type of differential, remove the carrier assembly identifying the parts • inspect differential housing for filings and inspect gears and bearings for wear and repair needs	

Concept	Specific Learner Expectations	Notes
Inspect/Service and Repair (continued)	*The student should:* • calculate differential gear ratio between the crown and pinion gears and determine the torque multiplication that results • reassemble differential and check assembly for leaks, replacing the required seals or recommending repair required • inspect the power train components for alignment, wear and looseness • using a mechanics stethoscope, test the assemblies for noise at bearing locations while the system is being operated • determine the cause of noise or vibration and repair or recommend required repair • inspect isolation mounts and bushings at the power train assemblies to assess capability of noise or vibration transference.	
Career	• identify local businesses specializing in driveline repairs, and determine the work conditions and opportunities.	

MODULE MEC214: MANUAL TRANSMISSIONS AND TRANSAXLES

Level: **Intermediate**

Theme: **Guidance and Control Systems**

Prerequisite: **Power Trains (MEC213; recommended)**

Module Parameters: **Access to pilot shafts, specialized manual transmission tools, presses, pullers related resources and clutch, transmission and transaxle units**

Students perform inspection service and repair procedures on manual transmissions, transaxles and clutch assemblies.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established measures of safety and care when working with vehicles	• observed performance related to: – safe use of equipment, tools, materials and supplies – proper use of personal safety equipment – correct use of vehicle protective equipment – lifting techniques to avoid back injuries. *Assessment Tool* *Manual Transmission and Transaxles: Part 1, MEC214–1* *Standard* *Performance rating of 2 on each criteria*	20
• identify the parts and trace the power flow through a clutch, manual transmission and differential and manual transaxle assembly	• observed performance related to: – identification of the parts/components of power train utilizing manual transmission/transaxle – understanding the flow of power through a manual transmission/transaxle *Assessment Tool* *Manual Transmission and Transaxles: Part 2, MEC214–1* *Standard* *Performance rating of 2 on each criteria*	30

MODULE MEC214: MANUAL TRANSMISSIONS AND TRANSAXLES (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• inspect, diagnose, service and repair clutch, manual transmission or manual transaxle assembly	• observed performance related to: – inspection of a manual power train – diagnosis of problems of a manual power train – service of a manual power train – repair or replacement of a clutch assembly – disassembly, inspection and reassembly of a manual transmission. *Assessment Tool* *Manual Transmission and Transaxles: Part 3, MEC214–1* *Standard* *Performance rating of 2 on each criteria*	50
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures • recognize back problems associated lifting heavy objects.	WHMIS, asbestos caution.
Identify/Function	• describe the operation of a clutch assembly, a manual transmission and a manual transaxle during various modes of vehicle operation • indicate the relationship that the clutch and manual gear box have to other parts of the power train • identify the parts of the assemblies, using the proper technical terms.	

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • for each gear, determine the path of power through transmission or transaxle and compare the gear ratio of each power routing as well as the directional rotation.	
Inspection/Report	• check clutch pedal operation travel and free play adjustment • with assistance, test to identify any clutch operating faults • remove clutch inspection cover and check for wear to the clutch disc and pressure plate, as well as other visually available parts • inspect clutch linkage for faults and/or wear • shift through the complete pattern to ensure linkage operation • inspect linkage for any undue looseness or signs of wear • check lubricant for level, type and recommended change interval • inspect mounts, braces and isolator cushions for wear fatigue or damage • inspect the assembly for leakage and note location and seal at fault • prepare a repair cost estimate, prior to commencement of repairs, as identified during inspection or servicing.	Teamwork.
Identify/Analysis	• formulate probable causes for typical problems that develop with clutches: – grabbing – slipping – failing to release – noise when disengaged – noise when engaging • where possible, relate the hypothetical situation to a real vehicle condition	Where possible, relate the hypothetical situation to a real vehicle condition.

Concept	Specific Learner Expectations	Notes
Identify/Analysis (continued)	*The student should:* • formulate probable causes for typical problems that develop with manual gear boxes: – gears clashing – hard shifting – jumps out of gear – noises in specific gears – unable to engage gears – shifter noisy or loose – bearing noises.	Where possible, relate the hypothetical situation to a real vehicle condition.
Inspect/Service and Repair	• follow through on agreed-upon clutch repairs, identified and estimated to the teacher and the owner of the vehicle and/or • remove and reinstall a clutch disc, pressure plate assembly, pilot bearing and throw-out bearing; check each part to confirm the continued serviceability of the assembly and clean each part before reassembly. Adjust linkage to specified clearances • adjust clutch linkage for correct free play at pedal or, in the case of an automatic clutch adjuster, confirm the operation as being correct • follow through on agreed-upon transmission/ transaxle repairs, identified and estimated to the teacher and the owner of the vehicle and/or • disassemble, thoroughly inspect and reassemble a model transmission of three or four speeds with external linkage and constant mesh gearing • replace transmission lubricant with type specified.	Does not imply a complete overhaul (refer to MEC313). Does not imply a complete overhaul (refer to MEC313). As per manufacturer's recommendations.
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC215: SUSPENSION SYSTEMS

Level: **Intermediate**

Theme: **Suspension and Structural Systems**

Prerequisite: **Ride and Control Systems (MEC115)**

Module Parameters: **Access to suspension systems, specialized suspension tools and related resources**

Instructional Qualification: Client work must be checked by certified technician

Students develop the knowledge, skills and attitudes needed to service and maintain vehicle suspension systems.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safety procedures when working on suspension systems	• observed performance related to: – safe use of equipment, tools, materials, and supplies when working on suspension systems – personal use of safety apparel – use of safety materials to protect vehicle against damage. *Assessment Tool* *Suspension Systems: Part 1, MEC215–1* *Standard* *Performance rating of 2 on each criteria*	15
• identify defective suspension parts	• observed performance related to: – recognition of suspension parts – determining worn and malfunctioning parts – identify tolerances, indicators of defective suspension parts. *Assessment Tool* *Suspension Systems: Part 2, MEC215–1* *Standard* *Performance rating of 2 on each criteria*	15

MODULE MEC215: SUSPENSION SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• indicate worn or defective suspension parts	• observed performance on a given vehicle: – identification of worn and defective suspension components – determining reason for worn and/or defective suspension components – determining driveability problems caused by worn/defective suspension parts. *Assessment Tool* *Suspension Systems: Part 3, MEC215–1* *Standard* *Performance rating of 2 on each criteria*	25
• service a suspension system	• observed performance related to: – service of a suspension system – use of tools/ equipment/materials and resources – removal and replacement of suspension components. *Assessment Tool* *Suspension Systems: Part 4, MEC215–1* *Standard* *Performance rating of 2 on each criteria*	45
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures when working on suspensions.	

MODULE MEC215: SUSPENSION SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function	*The student should:* • describe the basic types of front and rear suspensions used on motor vehicles; e.g., short, long arm suspension and MacPherson strut • compare the advantages and disadvantages of using separate and integral frames in relation to suspension design, repair and servicing • explain the advantage of using a: – solid "I" beam – split "I" beam – independent front suspension and a: • rigid • independent rear suspension • determine why it is important to reduce the amount of unsprung weight • list the positive and negative features of using coil, leaf, torsion, rubber biscuit and air springs • explain the meaning of spring rate and travel. • list basic types and describe operation of shock absorbers, mounting techniques and methods of testing • explain how shock absorber ratio is calculated.	Gas shocks.
Inspect/Service	• examine a typical wheel bearing for faults; e.g., bent cage, etching, overheating and worn seal • repack a front or rear wheel bearing • lubricate suspension joints where necessary • inspect suspension components for damage and wear • determine how both frictional and weight carrying ball joints are checked for wear.	

MODULE MEC215: SUSPENSION SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Service and Repair	*The student should:* • remove and replace: – a shock absorber – a coil spring – a ball joint – a strut.	On road-licensed vehicle, have final inspection done by certified personnel
Consumer Awareness	• indicate the appropriate lifting and towing procedures relative to electronically controlled suspension systems.	
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC216: STEERING SYSTEMS

Level: **Intermediate**

Theme: **Suspension and Structural Systems**

Prerequisite: **Ride and Control Systems (MEC115)**

Module Parameters: **Access to steering systems, specialized steering tools and related resources**

Instructional Qualification: Client work must be checked by certified technician

Students develop the knowledge, skills and attitudes necessary to maintain a steering system.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe practices when working on steering systems	• observed performance related to: – personal safety and specific vehicle safety when working on steering components – safe use and care of equipment, tools, materials and vehicle parts. *Assessment Tool* *Steering Systems: Part 1, MEC216–1* *Standard* *Performance rating of 2 on each criteria*	10
• identify different steering system design and application	• measured performance related to: – identification of three or more common steering designs and applications – understanding of the advantages and limitations of steering designs – knowledge of the evolution of steering designs – identify steering components and their function. *Assessment Tool* *Steering Systems: Part 2, MEC216–1* *Standard* *Performance rating of 2 on each criteria*	15

MODULE MEC216: STEERING SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• service/ repair vehicle steering system	• observed performance related to: – identification of worn/defective steering systems and their components – procedures followed during service and repair to steering systems – retrieval and use of specifications and measurements in servicing and repairing steering systems – removal and replacement of steering components. *Assessment Tool* *Steering Systems: Part 3, MEC216–1* *Standard* *Performance rating of 2 on each criteria*	55
• list driving symptoms which indicate worn or defective steering parts	• observed performance related to: – recognition of driving symptoms and their connection to worn/defective steering parts – evaluation of specifications and measurements to locate worn/defective parts – analysis of parts to determine cause of wear and/or malfunction of steering parts *Assessment Tool* *Steering Systems: Part 4, MEC216–1* *Standard* *Performance rating of 2 on each criteria*	20
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures when working on steering systems, understand importance of vehicle safety – importance of proper torque – importance of proper steering adjustments.	People and property.
Identify/Function	• identify common types of steering gear used to create the necessary mechanical advantages to overcome tire resistance; e.g.: – worn and sector – Ross cam and lever – recirculating ball – rack and pinion • examine and compare the operation of two or more steering gear boxes • describe the steering linkage used with rack and pinion and recirculating ball type systems • examine the construction of a tie rod assembly and explain how it is built to accommodate up and down as well as lateral movement • explain the operation of four wheel steering and outline the advantages of this type of steering over a conventional two wheel system.	
Inspect/Service	• complete a work order form • check and adjust power steering fluid level • check the lubricant level in a manual steering gear and add the appropriate lubricant if necessary • lubricate steering parts • clean and inspect steering linkage for wear and replace if necessary • inspect steering joints, bushings and replace if necessary • adjust a manual steering gear • inspect and service rack and pinion steering gear • inspect and service power steering components.	On road-licensed vehicle, have final inspection done by certified personnel.

Concept	Specific Learner Expectations	Notes
Consumer Awareness	*The student should:* • list symptoms of worn or defective components • list factors that create premature steering failures.	
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC217: METAL REPAIR AND FINISHING

Level: **Intermediate**

Theme: **Suspension and Structural Systems**

Prerequisite: **Metal Forming and Finishing (MEC117; recommended)**

Module Parameters: **Access to MIG and gas welder, basic body hand/power tools and related resources**

Students repair major sheet metal damage.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe practices when metal forming and finishing on major sheet metal damage	• observed performance related to: – following shop procedures – selecting and using metal working, welding and hydraulic equipment. *Assessment Tool* *Metal Repair and Finishing: Part 1, MEC217–1* *Standard* *Performance rating of 2 on each criteria*	10
• identify different damage condition and repair procedures for major sheet metal damage	• use of appropriate resources to produce a report describing repair procedures on the following: – direct damage – indirect damage – buckles – forces created by collision. *Assessment Tool* *Metal Repair and Finishing: Part 2, MEC217–1* *Standard* *Performance rating of 2 on each criteria*	25

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• repair major sheet metal damage	• observed performance related to: – problem solving a repair – provide sequence of repair – using metal, welding and finishing equipment – repairing major sheet metal damage – repairing large rust out. *Assessment Tool* *Metal Repair and Finishing: Part 3, MEC217–1* *Standard* *Performance rating of 2 on each criteria*	65
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
	The student should:	
Health/Safety Hazards	• demonstrate safe practices in relation to: – use of welding equipment – use of solder – sheet metal straightening system.	Personal, property, environment. Hydraulic pulling equipment; come-along.
Identify/Analysis	• determine type/extent of minor sheet metal damage • list sequence of repair • analyze major sheet metal impact damage conditions: – direct damage – indirect damage • determine sequence of repair.	Non-structural. Work hardening, tears, gouges, buckles, pressure forces. Aluminum versus ferrous sheet metal.

MODULE MEC217: METAL REPAIR AND FINISHING (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Repair	*The student should:* • perform metal straightening • perform metal working • investigate/repair damaged aluminum panel • investigate/repair using body solder • describe large rust out methods of repair • determine the best method of repair • complete the repair.	May only be an investigation/ demonstration. Partial or complete panel.
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC218: TRIM REMOVAL AND INSTALLATION

Level: **Advanced**

Theme: **Suspension and Structural Systems**

Prerequisite: **Interior Finishes and Repairs (MEC222; recommended)**

Module Parameters: **Access to specialized trim tools and related resources**

Students explore the value, care, removal and repair of trim parts. Emphasis is on removal and installation without damage.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe practices in the use of tools and chemicals	• observed performance in: – following shop procedures pertaining to use of tools and chemicals. *Assessment Tool* *Trim Removal and Installation: Part 1, MEC218–1* *Standard* *Performance rating of 2 on each criteria*	10
• investigate interior and exterior trim systems used to enhance appearances	• presentation of a report describing: – interior/exterior trim materials – functions and arrangement of window and door lock hardware/parts – fasteners unique to interior/exterior. *Assessment Tool* *Trim Removal and Installation: Part 2, MEC218–1* *Standard* *Performance rating of 2 on each criteria*	10
• remove and install trim and weather-stripping	• observed performance related to: – interior door trim removal and installation – exterior trim removal and installation – use of trim tools. *Assessment Tool* *Trim Removal and Installation: Part 3, MEC218–1* *Standard* *Performance rating of 2 on each criteria*	45

MODULE MEC218: TRIM REMOVAL AND INSTALLATION (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• analyze and install enhancement trim	• observed performance related to a given vehicle: – analyze and propose enhancement trim – application of new trim, accessories, decals, vinyl overlays. *Assessment Tool* *Trim Removal and Installation: Part 4, MEC218–1* *Standard* *Performance rating of 2 on each criteria*	20
• explore career opportunities and further education	• presentation of a report on alternative career choices: – glass installation/removal – trim installation – accessory centres. *Assessment Tool* *Assessment Guide: Career Profile, MECCP–1* *Standard* *Performance rating of 2 on each criteria*	15
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • recognize hazards involved when working with trim.	Personal, property and environment.

Concept	Specific Learner Expectations	Notes
Identify/Analysis	*The student should:* • identify the materials used for interior trim, the fastening system for each and describe the correct method of removal • explore the methods to remove and install interior trim • describe precautions to be adhered to when removing and installing trim • describe principles of trim accessories, door locks, mirrors, etc. • remove and replace specified trim • identify fasteners specific to exterior trim, including clips and adhesives • explain the inherent value of decals, vinyl and overlays • describe procedures for removal of decals, vinyl and overlays • determine the function of weather-stripping • identify two or three different methods of weather-stripping and explain the significance of the differences • identify two or three procedures needed to remove accessories and implications for repair or replacement.	
Inspect/Repair	• practise correct procedures and tools used in the removal of moldings, emblems and accessories • install selected exterior trim • successfully remove and install a door seal, test seal and adjust hardware accordingly • service accessories considered to be trim; e.g., locks, mirrors, lights.	
Careers	• explore further education, work conditions and opportunities.	

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MODULE MEC219: SURFACE PREPARATION II

Level: **Intermediate**

Theme: **Suspension and Structural Systems**

Prerequisite: **Surface Preparation I (MEC119; recommended)**

Module Parameters: **Access to auto body hand/power tools related resources**

Students perform advanced surface preparation.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe practices when doing advanced surface preparation	• observed performance related to: – following safe practices and use of proper personal protective equipment – following shop routines – use of WHMIS bulletins with respect to surface preparation. *Assessment Tool* *Surface Preparation II: Part 1, MEC219–1* *Standard* *Performance rating of 2 on each criteria*	10
• explain materials and practices in performing advanced surface preparation	• observed performance in: – listing and identifying metals/metal condition and respective preparation techniques – listing and identifying plastics and respective preparation techniques – listing abrasives and identifying application – listing and describing chemical use in surface preparation – listing coatings and application techniques and processes. *Assessment Tool* *Surface Preparation II: Part 2, MEC219–1* *Standard* *Performance rating of 2 on each criteria*	40

MODULE MEC219: SURFACE PREPARATION II (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• do an advanced surface preparation	• observed performance related to: – analyzing and determining preparation process – use of chemical preparation – application of coatings – compounding a surface *Assessment Tool* *Surface Preparation II: Part 3, MEC219–1* *Standard* *Performance rating of 2 on each criteria*	50
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
	The student should:	
Health/Safety Hazards	• demonstrate safe practices in relation to chemicals.	Personal, property and environment. WHMIS; check with supplier for handling procedures.
Identify/Analyze	• identify specific metal treatments, such as: – aluminum – plymetal – galvanized – other	Aluminum; plymetal; galvanized; new anodized aluminum. Prepare metal replacement parts.
	• identify equipment, materials and accepted procedures in compounding surfaces	Spot repair; adjacent panel matching.
	• match adhesion promoters to type of plastic being finished	

MODULE MEC219: SURFACE PREPARATION II (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	*The student should:* • use correct cleaning agent to match plastics and product used • recognize the possibility of custom masking.	Flexible plastic; rigid plastic; interior/exterior plastics; cleaners. Flames; elaborate striping.
Inspect/Repair	• analyze and prepare bare metal • clean and treat surface rust as conditions dictate • compound surfaces • prime plastic parts • custom mask a small project.	Spot blasting; sanding; chemical treatment. Flexible filling primer; special adhesion promoters.
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC220: REFINISHING I

Level: **Intermediate**

Theme: **Suspension and Structural Systems**

Prerequisite: **Surface Preparation II (MEC219; recommended)**

Module Parameters: **Access to spray equipment and related resources**

Students demonstrate metal surface refinishing procedures.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe practices and follow all warnings identified by manufacturer and Occupational Health and Safety	• observed performance related to: – health hazards involved in refinishing – warnings as outlined in WHMIS bulletins – following proper personal and shop safety routines. *Assessment Tool* *Refinishing I: Part 1, MEC220–1* *Standard* *Performance rating of 2 on each criteria*	15
• know refinishing products and equipment	• presentation of a report identifying and describing: – paint spray systems (two) – paint spray techniques – problems created by improper techniques and equipment. *Assessment Tool* *Refinishing I: Part 2, MEC220–1* *Standard* *Performance rating of 2 on each criteria*	30

MODULE MEC220: REFINISHING I (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • demonstrate proper refinishing application	*Assessment of student achievement will be based on:* • observed performance related to: – proper use of paint products (paint reducer/ hardener) – following demonstrated spray techniques – following proper spray procedures – proper care of spray equipment. *Assessment Tool* *Refinishing I: Part 3, MEC220–1* *Standard* *Performance rating of 2 on each criteria*	55
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • know health hazards and environmental impacts of products used • demonstrate use of personal protective equipment as recommended by manufacturer.	WHMIS; product information. MSDS Sheets available. Respirators; glove, coveralls.
Identify/Analyze	• identify types of top coats, solvents and additives • identify and select colour and type of paint on a given vehicle • understand procedure in paint preparation. • inspect pre-paint project and determine deficiencies • identify basic spray gun types • spray gun troubleshoot	Mixing measurements; additive, solvents; agitation. Masking, surface preparation to acceptable standards. Suction feed; gravity feed; pressure pot, HVLP.

MODULE MEC220: REFINISHING I (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	*The student should:* • be knowledgeable of refinishing equipment accessories • understand proper top coat application techniques • perform basic application problem troubleshooting.	Size and type of air lines; air cleaning and control devices. Dry spray; runs, etc.
Investigate/Repair	• prepare booth for spraying • prepare and apply top coat • understand and perform cleaning of spray guns • perform final detailing: – removal of masking/tape – check and correct surface defects – final cleaning and inspection.	Cleanliness; anti-static systems. Polishing if required.
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC221: BASIC TOUCH-UP AND FINISHING

Level: **Intermediate**

Theme: **Suspension and Structural Systems**

Prerequisite: **Vehicle Structures and Materials (MEC116; recommended)**
Refinishing I (MEC220)

Module Parameters: **Access to spray equipment and related resources**

Students determine and use the appropriate materials, tools and processes to make minor surface repairs.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• practise the safe handling, use and disposal of hazardous touch-up and finishing products	• observed performance related to: – safe handling of refinish products – proper use of refinish tools and equipment – following correct safety routines in disposal and clean-up of hazardous materials. *Assessment Tool* *Basic Touch-up and Finishing: Part 1, MEC221–1* *Standard* *Performance rating of 2 on each criteria*	15
• identify the techniques and products required to complete a minor surface repair	• given a repair problem demonstrate: – ability to outline a spot repair procedure – knowledge of repair procedures and products – proper use of primers, putties and cleaners – listing tools and equipment required for spot repair. *Assessment Tool* *Basic Touch-up and Finishing: Part 2, MEC221–1* *Standard* *Performance rating of 2 on each criteria*	40

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate the skills required to prepare and refinish a spot repair	• observed performance related to: – preparing spot repair for painting – selection of paint by code to match colour – application of paint following prescribed techniques. *Assessment Tool* *Basic Touch-up and Finishing: Part 3, MEC221–1* *Standard* *Performance rating of 2 on each criteria*	45
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • research and review the safety precautions required for: – feather edging with D/A sanders – handling of primer products and putties – spraying primers.	Personal, property and environment.
Identify/Analyze	• identify the imperfections in paint or freshly prepared surfaces; e.g., sand scratches, runs, dry spray, orange peel, "bulls eye", sags, chips • learn the spot repair concepts as required by industry including colour matching concepts of two types of paint: – solids – metallics • research the advantages of the base/clear system of paint in colour matching	

MODULE MEC221: BASIC TOUCH-UP AND FINISHING (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Repair	*The student should:* • perform a surface flaw repair of a painted panel, using sandpaper and compounds without repainting • prepare a panel for a spot repair and follow appropriate instructions in application of primer and paint • show proper procedure in the application and sanding of putties.	
Career Exploration	• explore further education and work opportunities related to touch-up and repair.	Chip repair and air brush use.

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MODULE MEC222: INTERIOR FINISHES AND REPAIRS

Level: **Intermediate**

Theme: **Suspension and Structural Systems**

Prerequisite: **Vehicle Structures and Materials (MEC116; recommended)**

Module Parameters: **Access to interior materials, products, tools, equipment and related resources**

Students search for and use the appropriate products and techniques to maintain vehicle interior surface materials.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• practise the safe handling, use and disposal of hazardous cleaning and repair products	• observed performance related to: – proper handling of volatile chemicals – proper disposal of environmentally unfriendly chemicals – following procedures necessary for protection of vehicle and persons. *Assessment Tool* *Interior Finishes and Repairs: Part 1, MEC222–1* *Standard* *Performance rating of 2 on each criteria*	20
• analyze type of repair or restoration and identify the techniques/products required to repair and/or restore an interior surface	• given samples of interior material: – identify and describe usage – describe proper care with products and procedures – relate common stains, spots and soils to methods needed for removal. *Assessment Tool* *Interior Finishes and Repairs: Part 2, MEC222–1* *Standard* *Performance rating of 2 on each criteria*	35

MODULE MEC222: INTERIOR FINISHES AND REPAIRS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• clean and/or repair an interior surface	• observed performance in completion of an interior clean and repair: – outlining steps/procedures required to restore a given surface – select and use tools and materials to complete a simple repair – select and use materials to clean an interior surface. *Assessment Tool* *Interior Finishes and Repairs: Part 3, MEC222–1* *Standard* *Performance rating of 2 on each criteria*	45
• demonstrate basic competencies.	• observations of individual effort and interpersonal exploration during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow safety rules and procedures for the products used for interior care • identify hazards associated with the improper use of certain volatile chemicals.	Personal, property and environment.

Concept	Specific Learner Expectations	Notes
Identify/Analyze	*The student should:* • identify cleaners for the following materials: – leather – cloth – vinyl – rubber – plastic – polyurethane foam • research the correct procedures and products that can safely be used for cleaning and maintenance, including volatile cleaners, neutral soaps and specialty products • compile an identification of interior parts and clean the parts to like-new condition or "best as can be expected", depending on condition. Include glass in the cleaning • examine and identify the nature of stains: soil, grease, oil, tar, blood, wax, chocolate and non-chocolate candy • identify correct procedures for removal of three of the above • compile a chart showing the stain removal procedures, including special products, if required.	Non-silicon products.
Inspect/Repair	• replace the vinyl or cloth covering on a door rest • complete a vinyl or plastic repair of a crack or hole in an interior part and refinish • successfully remove and replace weather stripping in either a door glass area or door opening • identify signs of poor sealing by weather stripping and adjust if possible.	
Career Exploration	• explore further education and career opportunities related to interior finishes and repairs.	

MODULE CURRICULUM AND ASSESSMENT STANDARDS

SECTION F: ADVANCED LEVEL

The following pages define the curriculum and assessment standards for the advanced level of Mechanics.

> Advanced level modules demand a higher level of expertise and help prepare students for entry into the workplace or a related post-secondary program.

Module MEC301: Buying and Selling a Vehicle F.3
Module MEC302: Vehicle Value Appraisal F.7
Module MEC303: Engine Performance Diagnosis F.11
Module MEC304: Engine Tune-ups F.15
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MODULE MEC301: BUYING AND SELLING A VEHICLE

Level: **Advanced**

Theme: **Vehicle Design and Ownership**

Prerequisite: **None**

Module Parameters: **Access to related resources**

Students develop the skills required to make an informed purchase or sale of a vehicle.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• investigate and determine the type of vehicle that best meets their needs	• a report indicating: – reasons for selecting a particular type of vehicle – how vehicle will meet financial, emotional and service constraints. *Assessment Tool* *Buying and Selling a Vehicle: Part 1, MEC301–1* *Standard* *Performance rating of 3 on each criteria*	15
• evaluate a vehicle in relationship to its condition and suitability	• inspection and comparison of selected vehicle to predetermined constraints *Assessment Tool* *Buying and Selling a Vehicle: Part 2, MEC301–1* *Standard* *Performance rating of 3 on each criteria*	35
• plan a strategy to sell or buy a vehicle	• thoroughness of report generated on selected plan, indicated: – outlining steps in selling or buying a vehicle – determining the value of the vehicle – advertising for or promoting a vehicle. *Assessment Tool* *Buying and Selling a Vehicle: Part 3, MEC301–1* *Standard* *Performance rating of 3 on each criteria*	25

MODULE MEC301: BUYING AND SELLING A VEHICLE (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• recognize the legal rights and responsibilities of both the seller and purchaser	• investigation of legal implications/obligations involved in: – buying a vehicle – selling a vehicle. *Assessment Tool* *Buying and Selling a Vehicle: Part 4, MEC301–1* *Standard* *Performance rating of 3 on each criteria*	15
• identify safety concerns when dealing with unfamiliar vehicles	• identification of safety related concerns when: – buying a vehicle – selling a vehicle *Assessment Tool* *Buying and Selling a Vehicle: Part 5, MEC301–1* *Standard* *Performance rating of 3 on each criteria*	10
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • identify safety concerns when dealing with unfamiliar vehicles.	
Consumer Awareness	• identify his or her choice of a vehicle on such factors as: – intended use and length of service – required performance and economy – funds or financing available – emotional appeal – consumer reports	

MODULE MEC301: BUYING AND SELLING A VEHICLE (continued)

Concept	Specific Learner Expectations	Notes
Consumer Awareness (continued)	*The student should:* • describe the advantages and disadvantages of purchasing a vehicle: – privately – by auction – through dealers – lease agencies – rental agencies – government agencies • determine the parts of a vehicle that can be inspected by: – visual means – road testing – instrument checks • make an offer to purchase considering the following: – condition and age of the vehicle – dealer cost – profit level – value of trade in – cost of financing – ability to pay or make payment – possible liens • select or recommend a seller based on: – the seller's reputation – ability to service – willingness to back the product – number of vehicles to choose from • organize and prepare a record of the vehicle's service and maintenance record	Engine, brakes, steering, body. Observing contract/ bill of sale. Legal obligations.
Inspect/Service	• prepare the vehicle so that it looks as close to new as possible	Could be combined with MEC102 and MEC201.

Concept	Specific Learner Expectations	Notes
Inspect/Service (continued)	*The student should:* • determine the value of a vehicle by: – having it appraised by more than one individual – comparing the appraisal to the Blue Book price – calculating the value through depreciation – comparing the asking price of similar vehicles • explore the advantages of selling a vehicle: – on consignment – privately – on a trade • identify legal steps when buying and selling a vehicle.	Information from car dealer. Used car sales person as resource.
Careers	• investigate career opportunities related to: – vehicle sales – appraisals – financing.	

MODULE MEC302: VEHICLE VALUE APPRAISAL

Level: **Advanced**

Theme: **Vehicle Design and Ownership**

Prerequisites: **Vehicle Maintenance (MEC202; recommended)**

Module Parameters: **Access to related resources**

Students develop an understanding of the use of industry standard references to arrive at an estimation of the cost of a mechanical repair and the market value of a vehicle.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established procedures of safety and care when inspecting vehicles	• observed performance in: – following established shop/lab routines – safety and care as related to inspections. *Assessment Tool* *Vehicle Value Appraisal: Part 1, MEC302–1* *Standard* *Performance rating of 3 on each criteria*	10
• inspect a vehicle to determine repair requirements and assess the overall vehicle condition	• inspection performance in: – covering all systems – reporting required service/repair – estimating costs of required service/repair. *Assessment Tool* *Vehicle Value Appraisal: Part 2, MEC302–1* *Standard* *Performance rating of 3 on each criteria*	35
• apply accepted industry standard references to problems of estimation and appraisal	• generated report indicated problems of estimating appraising within industry dictated standards. *Assessment Tool* *Vehicle Value Appraisal: Part 3, MEC302–1* *Standard* *Performance rating of 3 on each criteria*	15

MODULE MEC302: VEHICLE VALUE APPRAISAL (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate the ability to complete a repair estimation to automobile industry standards and to prepare a vehicle market value estimate	• observed performance in: – completeness of report – inclusion of industry standards – matching true market value. *Assessment Tool* *Vehicle Value Appraisal: Part 4, MEC302–1* *Standard* *Performance rating of 3 on each criteria*	30
• outline the best business practices to follow when situations of uncertainty or conflicting interests occur relative to estimation and valuation	• outlining business practices to follow during problematic situations. *Assessment Tool* *Vehicle Value Appraisal: Part 5, MEC302–1* *Standard* *Performance rating of 3 on each criteria*	10
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow predetermined shop guidelines when working on or around vehicles.	

MODULE MEC302: VEHICLE VALUE APPRAISAL (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze	*The student should:* • investigate the condition of a vehicle using a comprehensive method, including owner interview and inspection report completion • examine the system(s) that require repair to determine the extent of reconditioning required to return the system(s) to serviceability • construct a basis for vehicle valuation by determining the vehicle characteristics that would contribute to market value (e.g., year, make, model, options, mileage, relative condition, classic attractiveness) • complete an evaluation checklist • develop a complete listing of probable and possible parts required to effect a complete repair OEM, aftermarket and used parts • using an accepted industry labour guide, determine the correct labour charges for the required parts replacements, considering all modifications or options to the subject vehicle • establish the wholesale value of a subject vehicle using the accepted wholesale reference guides • determine the market value of a subject vehicle by comparative pricing on three similar vehicles in the local marketplace • determine business practice when resolving conflicts related to estimations and evaluations.	Include the repair estimate of cost, any shop supply, taxes or other charges that would contribute to the total estimated price. For example, Red Book, Black Book, Blue Book. Use Alberta Motor Association as resource. Explore linkages with auto industry. Use consumer guide.
Inspect/Report	• assess the wisdom of repairing a vehicle considering all factors affecting market resale evaluation • prepare an estimation/evaluation summary for presentation to a vehicle owner • determine the best course of completing the requested repairs ensuring the security of the business enterprise.	

MODULE MEC302: VEHICLE VALUE APPRAISAL (continued)

Concept	Specific Learner Expectations	Notes
Careers	*The student should:* • identify further education and work opportunities related to vehicle value appraisal.	

MODULE MEC303: ENGINE PERFORMANCE DIAGNOSIS

Level: **Advanced**

Theme: **Propulsion Systems**

Prerequisites: **Lubrication and Cooling Systems (MEC203)**
Fuel and Exhaust Systems (MEC204)
Ignition Systems (MEC206)
Emission Controls (MEC207)

Module Parameters: **Access to vehicle engine, diagnostic test equipment and related resources**

Students will learn to trouble-diagnose an engine for worn/damaged parts and/or improper adjustments.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe practices while doing engine performance diagnosis	• observed performance in: – following safe lab practices – recognizing potential hazards during engine diagnosis. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	10
• diagnose performance of an engine by listening, touching and observing	• observed performance in demonstrating ability to diagnose engine problems by using: – sense of touch – sense of hearing. *Assessment Tool* *Engine Performance Diagnosis: Part 1, MEC303–1* *Standard* *Performance rating of 3 on each criteria*	25

MODULE MEC303: ENGINE PERFORMANCE DIAGNOSIS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• assess engine conditions with specialized test equipment and on-board diagnostics	• observed performance in using equipment to determine the condition of the following, in a given engine: – ignition systems – fuel system – cooling/exhaust system – emission control – mechanical. *Assessment Tool* *Engine Performance Diagnosis: Part 2, MEC303–1* *Standard* *Performance rating of 3 on each criteria*	50
• provide a report on the condition of engines diagnosed	• report generated to reflect the true condition of a given engine. *Assessment Tool* *Engine Performance Diagnosis: Part 3, MEC303–1* *Standard* *Performance rating of 3 on each criteria* *Illustrative Example: Engine Performance Diagnosis, MEC303–2*	15
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • demonstrate safety while diagnosing engines.	

MODULE MEC303: ENGINE PERFORMANCE DIAGNOSIS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze	*The student should:* • list possible engine problems based on information provided	Owner complaints.
	• through listening, observing, touching a running and/or stopped engine, determine whether abnormalities exist.	For example,, noises, blow-by, oil leaks, loose connections/ parts, oil/coolant conditions, belts, hoses, filters
	• analyze intake manifold vacuum • check ignition timing and advance mechanisms • check for proper idle speeds • check engine oil pressure • check cylinder compression readings • with an engine analyzer and/or computerized tester, determine the condition of various engine systems as per capability of the test unit • check exhaust emissions • determine any abnormalities on the vehicle, using gauges and lights, including self-diagnostics	
	• compile all information and generate a report for the customer outlining defects found and recommended corrections.	Students generate their own format.
Career	• identify further education and career opportunities related to engine performance and diagnosis.	

MODULE MEC304: **ENGINE TUNE-UPS**

Level: **Advanced**

Theme: **Propulsion Systems**

Prerequisites: **Lubrication and Cooling Systems (MEC203)**
Fuel and Exhaust Systems (MEC204)
Ignition Systems (MEC206)
Emission Controls (MEC207)
Electrical Components (MEC209)
Engine Performance Diagnosis (MEC303; recommended)

Module Parameters: **Access to engine diagnostic equipment and supporting resources**

Students diagnose, service and repair engine, fuel, ignition, charging and starting systems.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe work habits while doing a tune-up	• observed performance in: – following shop/lab established procedures – recognizing and observing aspects that protect equipment and vehicle. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	10
• determine engine mechanical condition	• observed performance in equipment procedural use and results obtained in determining mechanical condition. *Assessment Tool* *Engine Tune-up: Part 1, MEC304–1* *Standard* *Performance rating of 3 on each criteria* *Illustrative Example: Engine Tune-up Part 1 MEC304–2*	15

MODULE MEC304: ENGINE TUNE-UPS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• check and service carburetor and fuel injection systems	• observed performance in servicing fuel systems including: – carburetors – fuel injectors – related components. *Assessment Tool* *Engine Tune-Ups: Part 2, MEC304–1* *Standard* *Performance rating of 3 on each criteria* *Illustrative Example: Engine Tune-Ups Part 2 MEC304–2*	25
• use diagnostic equipment to check, interpret and service ignition, charging, starting, emission control and exhaust systems	• observed performance in use of equipment to check, interpret and service ignition, charging, starting, emission and exhaust systems. *Assessment Tool* *Engine Tune-Ups: Part 3, MEC304–1* *Standard* *Performance rating of 3 on each criteria* *Illustrative Example: Engine Tune-Ups Part 3 MEC304–2*	50
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures.	Personal, property and environment.

MODULE MEC304: ENGINE TUNE-UPS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze	*The student should:* • perform a static and dynamic compression test to determine mechanical condition of an engine • do a leak down test • record and analyze results.	
Inspect/Service and Repair	• determine whether a carburetor problem exists and document specifics • remove, clean and adjust a carburetor • check and/or replace filters • test fuel pump pressure and capacity • determine whether a problem exists and document specifics • clean fuel injectors • with diagnostic equipment, diagnose ignition system and document specifics • service spark plugs, wires, distributor cap, rotor, points, pick-up coil, spark advance • check and adjust ignition timing • operate starter and determine if problem exists (noises, drive engagement, speed, etc.) • check amperage draw and correct • check circuit voltage drops and correct • check battery condition, and service • do a visual check; i.e., wires, connections, belt condition/tension • check alternator for noise, vibration • check alternator output and voltage regulation and correct • diagnose computer controlled systems and document faults.	Diagnostic equipment required.

Concept	Specific Learner Expectations	Notes
Inspect/Service and Repair (continued)	*The student should:* • determine what emission control devices exist on vehicle and what emissions are being controlled • determine to what standards these devices control emissions • check if vehicle meets standards and correct • road test vehicle to determine engine performance and driveability • compile a report outlining test results, work done and present condition of engine and related parts/systems.	If equipment is available. Diagnostic printout.
Careers	• identify further education and work opportunities related to engine tune-ups.	

MODULE MEC305: ENGINE REMOVAL AND INSTALLATION

Level: **Advanced**

Theme: **Propulsion Systems**

Prerequisite: **Engine Performance Diagnosis (MEC303; recommended)**

Module Parameters: **Access to engine lift tools/equipment and supporting resources**

Students remove and install an engine in a chassis.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• safely use engine lifting tools/equipment	• observed performance in: – application and use of lifting tools and equipment – safely removing and installing an engine – following established shop/lab routines. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	10
• identify steps involved in preparing a vehicle for engine removal	• given a specific vehicle, identifying: – how engine will be removed – specific steps involved to point of engine removal. *Assessment Tool* *Engine Removal and Installation: Part 1, MEC305–1* *Standard* *Performance rating of 3 on each criteria* *Illustrative Example: Engine Removal and Installation, MEC305–2*	15
• remove and replace engine accessories	• given a vehicle, removing and replacing engine accessories and related components. *Assessment Tool* *Engine Removal and Installation: Part 2, MEC305–1* *Standard* *Performance rating of 3 on each criteria*	20

MODULE MEC305: ENGINE REMOVAL AND INSTALLATION (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• remove and install an engine in a chassis	• observed performance in removing and installing an engine. *Assessment Tool* *Engine Removal and Installation: Part 3, MEC305–1* *Standard* *Performance rating of 3 on each criteria*	30
• perform post engine installation start-up and adjustment	• observed performance in post engine installation start-up and adjustments. *Assessment Tool* *Engine Removal and Installation: Part 4, MEC305–1* *Standard* *Performance rating of 3 on each criteria*	25
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period: – managing learning – working with others – demonstrating responsibility. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • know types of lifting tools/equipment available for engines • know where to attach devices • determine procedures to follow to remove and install an engine • observe precautions when working with vehicle equipped with air conditioning.	Tool, bolt size, location, torque.

MODULE MEC305: ENGINE REMOVAL AND INSTALLATION (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze	*The student should:* • determine how to park and take steps to protect a vehicle in preparation for engine removal • identify all wiring, hoses, cables, pipes that require disconnecting • identify units and special fasteners that will be removed.	Paint protection; scribing/marking components. Masking; photograph. With or without transmission, motor mounts.
Inspect/Service	• disconnect and service battery • drain and dispose of lubricant and coolant • remove appropriate wires, hoses, cables, pipes, units • remove and/or install an engine • dismantle/assemble an engine • reconnect all disconnects • install lubricants/coolant • service and store battery • drain/store or dispose fluids • determine the most appropriate method and remove and replace the following: – wires – cables – hoses – pipes – accessories – cylinder head – cylinder block • adjust and service engine • start engine and check for proper performance.	Blocking fuel line; fasteners organized. Allow for rebuilt components to be used: heads, short blocks. Gasoline removal and storage precautions. Organizing fasteners. Identification of disconnects for later connects. Depending on circumstance, engine may be removed as an assembly. Module maybe combined with Engine Performance Diagnosis (MEC303), Engine Tune-ups (MEC304), Engine Reconditioning I (MEC306, Engine Reconditioning II (MEC307).

MODULE MEC305: ENGINE REMOVAL AND INSTALLATION (continued)

Concept	Specific Learner Expectations	Notes
Careers	*The student should:* • identify further education and work opportunities related to engine removal and installation.	Trade areas.

MODULE MEC306: ENGINE RECONDITIONING I

Level: **Advanced**

Theme: **Propulsion Systems**

Prerequisites: **Engine Fundamentals (MEC104)**
Engine Performance Diagnosis (MEC303)
Engine Tune-up (MEC304; recommended)

Module Parameter: **Access to cylinder head rebuilding equipment measuring tools and related resources**

Students determine the need for service and perform the required service for the cylinder head and related components.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safety procedures related to cylinder head work	• observed performance in following: – precautions related to removal and installation of cylinder head(s) – safe practices in reconditioning cylinder head(s). *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	10
• before disassembling, inspect cylinder head for required service	• given a cylinder head, reporting on: – indicators dictating cylinder head work – possible faults suspected. *Assessment Tool* *Cylinder Head Reconditioning: Part 1, MEC306–1* *Standard* *Performance rating of 3 on each criteria*	15

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• recondition a cylinder head and related components	• observed performance in: – disassembly of a cylinder head – checking/measuring to determine condition of cylinder head, valves, seats, guides, springs – reconditioning valves, seats and guides – assembly of cylinder head and required checks—valve spring and stem heights – checking condition of related components: • rocker arms (shafts) • push rods • camshaft • lifters • sprockets, gears, chains. *Assessment Tool* *Cylinder Head Reconditioning: Part 2, MEC306–1* *Standard* *Performance rating of 3 on each criteria* *Illustrative Example: Cylinder Head Reconditioning, MEC306–2*	60
• remove and install cylinder head	• observed performance in: – removing a cylinder head according to manufacturer's recommended procedures – installation of cylinder head and related components observing torque and sequence, head gasket positioning and other related gaskets – adjustments related to the work. *Assessment Tool* *Cylinder Head Reconditioning: Part 3, MEC306–1* *Standard* *Performance rating of 3 on each criteria*	15
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period: – managing learning – managing resources – demonstrating responsibility. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

MODULE MEC306: ENGINE RECONDITIONING I (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures.	
Identify/Analyze	• perform checks to determine condition of cylinder head and related parts • research blue printing procedures for cylinder heads • investigate costs of blue printing.	Compression test, vacuum test, valve timing, oil pressure.
Inspect/Service	• clean cylinder head and related parts • inspect parts for serviceability • machine parts • assemble cylinder head and check valve spring and stem height • service push rods, lifters, rocker arms, chain, gears and camshaft, pulleys, belts • install cylinder head and make adjustments • run engine and evaluate work done • adjust to specifications.	Field trips to machine shops. Cracks, warpage, guide, valve stem wear. Grind valves, seats, recondition guides. Torque, sequence, specification and techniques.
Careers	• research the demand for skills related to engine reconditioning.	

MODULE MEC307: ENGINE RECONDITIONING II

Level: **Advanced**

Theme: **Propulsion Systems**

Prerequisites: **Engine Fundamentals (MEC104)**
Engine Performance Diagnosis (MEC303)
Engine Reconditioning I (MEC306; recommended)

Module Parameters: **Access to engine measuring tools, cylinder block reconditioning tools/equipment and related resources**

Students determine the need for service, and perform service on a cylinder block assembly and related components.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safety procedures while reconditioning cylinder blocks	• observed performance in: – following established shop/lab routines – safely using engine reconditioning tools/equipment. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	10
• determine the need for cylinder block service before disassembling block	• given an engine, being able to determine: – the need for work through inspection of cylinder block, pistons, rods, crankshaft, camshaft, bearings and other related components – cost of repair – the appropriate procedure to follow considering all factors. *Assessment Tool* *Cylinder Block Reconditioning: Part 1, MEC307–1* *Standard* *Performance rating of 3 on each criteria*	25

MODULE MEC307: ENGINE RECONDITIONING II (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• disassemble and reassemble cylinder block	• given a cylinder block assembly, observed performance in disassembly and assembly observing component repositioning. *Assessment Tool* *Cylinder Block Reconditioning: Part 3, MEC307–1* *Standard* *Performance rating of 3 on each criteria*	25
• recondition a cylinder block and related components	• given a cylinder block, observed performance in reconditioning: – cylinder block – connecting rods – pistons. *Assessment Tool* *Cylinder Block Reconditioning: Part 2, MEC307–1* *Standard* *Performance rating of 3 on each criteria* *Illustrative Example: Cylinder Block Reconditioning, MEC307–2*	40
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow safety practices related to reconditioning cylinder blocks.	Personal, property and environment.
Identify/Analyze	• list possible engine problems based on information provided.	Customer complaints.

MODULE MEC307: ENGINE RECONDITIONING II (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	*The student should:* • research blue printing procedures for cylinder blocks • estimate costs.	
Inspect/Service	• clean all engine block components • inspect following components for serviceability: – block – cylinder(s) – crankshaft – camshaft(s) – piston(s) – connecting rod(s) – lifters – bearings – chains, sprockets, pulleys, belts – other • assess what servicing is required • machine/service components as required • assemble engine block observing proper tolerances.	Block disassembled in MEC304. Alignment, warpage, cracks. Size, taper, out-of-roundness, condition. Bends, cracks, journal size, taper, out-of-roundness, condition. Bends, lobe/journal wear (if part of the block). Size, taper, condition, piston clearance, piston pin, grooves. Straightness, big/small end size. Base wear, condition. Camshaft—size, wear. Deglaze, bore, hone, resize, replace. Combine with Engine Tune-ups (MEC304), Engine Removal and Installation (MEC305) for installation and running.
Careers	• research the demand for skills related to engine reconditioning.	

MODULE MEC308: ALTERNATE PROPULSION SYSTEMS

Level: **Advanced**

Theme: **Propulsion Systems**

Prerequisites: **Alternative Fuel Engines (MEC205)**
Engine Fundamentals (MEC104; recommended)

Module Parameters: **Access to support resources**

Students develop an understanding of why vehicle manufacturers continue to build the crank-piston, internal combustion, gasoline engine and also explore some other engine designs.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• research and describe the historical development of commonly used engine designs from Nickolous Otto to present manufacturing techniques	• a report generated indicating: – historical development of internal combustion engines – engine manufacturing techniques. *Assessment Tool* *Alternate Propulsion System: Part 1, MEC308–1* *Standard* *Performance rating of 3 on each criteria*	20
• explore engine design innovation, using different fuels in present engines and using present fuels in engines of different design	• a report with the following: – engine design and how it relates to fuels (other than gasoline) – alternate engine designs (other than conventional piston engine) including electric power – state advantages and disadvantages of designs. *Assessment Tool* *Alternate Propulsion System: Part 2, MEC308–1* *Standard* *Performance rating of 3 on each criteria*	40
• identify opportunities for future development in this specialized area of manufacture and repair	• identified opportunities for future development of alternative propulsion systems. *Assessment Tool* *Alternate Propulsion System: Part 3, MEC308–1* *Standard* *Performance rating of 3 on each criteria*	40

MODULE MEC308: ALTERNATE PROPULSION SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • demonstrate basic competencies.	*Assessment of student achievement will be based on:* • observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Identify/Analyze	*The student should:* • prepare and present a report detailing the origin of the first working internal combustion engine, the major advances made in the design of internal combustion engines and the manufacturing process improvements that made those innovations possible over the history of engine design. • examine the developments of and compare the relative efficacy of alternative contemporary design engines to the large-scale manufacture of motor vehicles. The engines examined might include the following: Wankel, Gas Turbine, New Concept Rotary, Kauertz Rotary Vane, Rotorcam, Split-Cycle Mighty-Mite, Bricklin Rotary Vee, Reg Technologies Rand Cam Selwood Orbital and Stirling • determine the rationale for change in engine design considering the factors of environmental and fuel supply significance • prepare and present a study of initiatives for using alternate fuels in engines and the factors affecting these situations	Turbo charging. Super charging.

MODULE MEC308: ALTERNATE PROPULSION SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	*The student should:* • examine and report on the present initiatives to build electric-powered cars and batteries of sufficient capacity to power them • determine which direction of alternative propulsion system development promises the most likely success.	
Careers	• predict the opportunity for career opportunities related to emerging technological development.	

MODULE MEC309: COMPUTER MANAGEMENT SYSTEMS

Level: **Advanced**

Theme: **Guidance and Control Systems**

Prerequisite: **Electrical Components (MEC209; recommended)**

Module Parameters: **Access to computer management system diagnostic equipment and related resources**

Students acquire an overview of the application of computer management systems used in modern vehicles.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established procedures of safety and care related to computer management systems	• measured performance related to: – demonstrating compliance with safety and care related to computer systems – care and safety in the use of tools, equipment and materials – anti-static precautions associated with the handling of CPUs. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	15
• identify the principles that apply to all computer management systems	• observed performance related to: – identification of common principles shared by all computer management systems – comparisons between input devices and output devices used in vehicles and on PCs. *Assessment Tool* *Computer Management: Part 1, MEC309–1* *Standard* *Performance rating of 3 on each criteria*	20

MODULE MEC309: COMPUTER MANAGEMENT SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• locate the components of selected computer management systems and describe their function	• observed performance related to: – location of the components of computer management systems – descriptions of component points and their relationship to the systems. *Assessment Tool* *Computer Management: Part 2, MEC309–1* *Standard* *Performance rating of 3 on each criteria*	15
• demonstrate how computer management systems operate	• measured performance related to: – demonstrating how computer management systems get information, process information and make adjustments – changing input values and predicting output values on a computer system or schematic. *Assessment Tool* *Computer Management: Part 3, MEC309–1* *Standard* *Performance rating of 3 on each criteria*	20
• perform diagnostic analysis of selected computer management systems and make required repairs or replacement of malfunctioning parts	• measured performance related to: – correct diagnosis and analysis of computer management systems – procedures for repair or replacement of parts – accuracy and skill in performing task. *Assessment Tool* *Computer Management: Part 4, MEC309–1* *Standard* *Performance rating of 3 on each criteria*	30
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

MODULE MEC309: COMPUTER MANAGEMENT SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow practices that promote safety for people and the environment.	Damage precautions regarding CPU units.
Identify/Function	• identify the different computer control systems that are now available on vehicles • discuss the functions these computer control systems perform • state the ways in which these computer control systems replaced mechanical systems • demonstrate how selected computer control systems work compared to the old mechanical systems • identify the principles and functions of computer control systems • locate and identify the parts of selected computer management systems • describe the function of the parts of a selected computer management system • forecast types of computer management systems that may be used on future vehicles.	
Inspect/Service	• perform diagnostic analysis of selected computer management systems • replace parts or make necessary repairs to correct malfunctioning computer management systems.	Faulty diagnostics will damage CPU unit.
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC310: SAFETY SYSTEMS

Level: **Advanced**

Theme: **Guidance and Control**

Prerequisites: **Power Assist Accessories (MEC210)**
Electrical Components (MEC209; recommended)

Module Parameters: **Access to support resources and vehicles with safety systems**

Instructional Qualification: Client work must be checked by certified technician

Students gain an understanding of how safety systems can be tested, diagnosed, replaced or repaired.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established procedures of safety and care while working with safety systems	• observed performance related to: – appropriate use of equipment, tools and materials when working on safety systems – specific procedures used when working on safety systems such as ABS and air bags. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	10
• research, list and compare safety systems that protect vehicle occupants	• measured performance related to: – research of vehicle safety systems – comparisons of types of safety systems – developments of safety systems – predictions about possible future safety systems. *Assessment Tool* *Safety Systems: Part 1, MEC310–1* *Standard* *Performance rating of 3 on each criteria*	40

MODULE MEC310: SAFETY SYSTEMS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• diagnose and service problems with vehicle safety systems	• observed performance related to: – accurate diagnosis of problems in safety systems – procedures followed to service safety systems. *Assessment Tool* *Safety Systems: Part 2, MEC310–1* *Standard* *Performance rating of 3 on each criteria*	50
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
	The student should:	
Health/Safety Hazards	• demonstrate and follow established safety rules when working on safety systems.	Caution: SRS system. Note potential for injury from deployment of SRS systems; e.g., air bags, seat belt tensioners.
	• display the use of safety procedures and precautions necessary to avoid damage to vehicle safety systems.	Need for resources.
Investigate/Report	• research safety systems found in automobiles and list the dates various safety systems were introduced in the vehicle • discuss the effect various safety systems have had in reducing fatalities • debate which safety systems are most effective in human lives, cost of manufacture and ease of use.	

MODULE MEC310: SAFETY SYSTEMS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function	*The student should:* • identify safety systems in selected vehicles • list the parts of these safety systems • describe the function of these systems.	
Inspect/Service	• diagnose the condition and any problems found on safety systems • replace parts or make repairs to malfunctioning parts of safety systems.	
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC311: CLIMATE CONTROL

Level: **Advanced**

Theme: **Guidance and Control Systems**

Prerequisite: **Lubrication and Cooling Systems (MEC203; recommended)**

Module Parameters: **Access to air conditioning test equipment and support resources**

Instructional Qualification: **Work must be checked by certified technician when student is working with refrigerants**

Students expand their knowledge of the purpose, operation and servicing of standard heating and air conditioning systems.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established procedures of safety and care when working with climate control systems	• measured performance related to: – safety when working on climate control systems – procedures followed when working with refrigerants – safety and care used with vehicles, equipment, tools and materials. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	15
• identify the purpose and describe the functions of heater and air conditioning system components	• observed performance related to: – identification of the parts/components – description of the function of heater and air conditioning – describe how the components combine their functions to produce heat or cold. *Assessment Tool* *Climate Control: Part 1, MEC311–1* *Standard* *Performance rating of 3 on each criteria*	25

MODULE MEC311: CLIMATE CONTROL (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• carry out inspection, diagnosis, service and repair procedures on heater and air conditioning systems and components of those systems	• observed performance related to: – inspection of climate control systems as outlined in service manuals and shop procedures – accurate diagnosis of climate control systems performance – repairs to climate control systems as outlined in manuals and procedures. *Assessment Tool* *Safety Systems: Part 2, MEC310–1* *Standard* *Performance rating of 3 on each criteria*	40
• identify global concerns about the release of refrigerants into the atmosphere as well as the alternatives to standard refrigerants and the required recycling procedure	• measured performance related to: – research into the effect of refrigerants on the eco-system – research into alternate refrigerants – understanding of recycling laws and procedures. *Assessment Tool* *Safety Systems: Part 3, MEC310–1* *Standard* *Performance rating of 3 on each criteria*	20
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

MODULE MEC311: CLIMATE CONTROL (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures. • generate a list of safety concerns when working with refrigerants • outline the legal restrictions about the disposal and recycling of R–12 refrigerants • identify the safety and environmental concerns with R–12 and R–12 replacements.	Legal restriction in disposal and reclaiming of R–12. Mixing refrigerants. Safety precautions when in contact with R–12 and when R–12 is in contact with open flame creating toxic gas.
Identify/Function	• describe the operation of the heater: heat exchange, the operation of controls for fan speed, and air flow controls • identify components of an air conditioning system • describe refrigeration principles • describe air conditioning system operation.	
Identify/Analyze	• determine the causes and repair procedures for standard heater operation malfunctions; e.g., blocked or leaking heater core, temperature cable adjustment, fan motor noise, vibration and speed abnormalities • conduct a visual and tactile check of operation of the refrigerant system and assess the service needs.	
Inspect/Service	• determine cause of malfunction in a climate control system and repair as required after consulting with the vehicle owner/teacher • pressure test the air conditioning refrigerant system and confirm the normalcy of system operation by comparing data with service manual • on A/C system, leak test, evacuate system, recharge, then leak test again.	In the case of equipment or facility shortage, a community partnership would be most helpful. Oil may need to be added.
Careers	• research the demand for skills related to climate control systems.	

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MODULE MEC312: POWER ASSISTING

Level: **Advanced**

Theme: **Guidance and Control Systems**

Prerequisites: **Electrical Components (MEC209) or**
Power Assist Accessories (MEC210) and
Hydraulic Accessories (MEC212; recommended)

Module Parameters: **Access to supporting resources, vacuum/pressure gauges, electrical test equipment**

Students further develop their knowledge of the purpose, operation, service and repair of pneumatic, hydraulic and electric power assist devices.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established procedures of safety and care when working with power assists	• observed performance related to: – personal safety when working with power assist systems – safety and care of vehicles, parts, equipment and materials – special precautions when working with power assists. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	10
• identify applications of power assist components to various vehicle systems and determine the rationale for specific applications	• observed performance related to: – identification of power assist systems such as pressure pumps, vacuum and electric motors – identification of components of power assist systems – analysis of the purpose and rationale for using power assist systems. *Assessment Tool* *Power Assisting: Part 1, MEC312–1* *Standard* *Performance rating of 3 on each criteria*	20

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• execute service and repair procedures to pneumatic, hydraulic and electric power assist devices according to manufacturer's prescribed methods	• measured performance related to: – service and repair to pneumatic, hydraulic and electric components – following procedures – achieving accurate measurements. *Assessment Tool* *Power Assisting: Part 2, 3, 4, MEC312–1* *Standard* *Performance rating of 3 on each criteria*	70
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow established lab procedures.	
Identify/Function	• describe situations in vehicle system design where power assist mechanisms are used • define the advantages of power assist over manual control as well as identify the type of power assist most adaptable for use in a particular situation.	
Identify/Analyze	• complete an inspection of a hydraulic power assist device using manufacturer's prescribed diagnostic procedures • estimate the repair costs for a defective or broken hydraulic assist and confer with the teacher or vehicle owner regarding the repair requirements	Steering, brakes.

MODULE MEC312: POWER ASSISTING (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	*The student should:* • complete an inspection of a pneumatic assist device or system using prescribed diagnostic procedures • prepare an estimate of the repair requirements of the pneumatic assist and confer with the teacher or vehicle owner regarding the repair needs • complete an inspection of an electric assist device using a prescribe diagnostic procedure • prepare an estimate of the repair requirements for the electric assist device and confer with the teacher or vehicle owner regarding the required repairs.	Vacuum assist brakes. Load levelers.
Inspect/Repair	• complete a repair procedure to an electric assist device or system • complete a repair procedure on a hydraulic assist unit. This could be a seal, hose, pump, reservoir or valve repair • complete a repair procedure on a pneumatic assist unit or system. Repairs could include any aspect of the system or device.	
Careers	• identify further education and work opportunities related to power assist devices.	

MODULE MEC313: AUTOMATIC TRANSMISSIONS

Level: **Advanced**

Theme: **Guidance and Control Systems**

Prerequisite: **Hydraulic Accessories (MEC212; recommended)**

Module Parameters: **Access to automatic transmission diagnostic tools, support resources**

Instructional Qualification: Client work must be checked by certified technician

Students develop their knowledge of automatic transmissions and transaxles, and their skills in diagnosing and executing some automatic transmission and transaxle repair requirements.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established procedures of safety and care when working with automatic transmissions and transaxles	• observed performance related to: – personal safety procedures – safety and care when working with equipment, tools and materials – following safety procedures specific to automatic transmissions and transaxles. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	15
• identify the parts of a torque converter and automatic transmission or transaxle and determine the path of power as well as the shifting control operation in each gear setting	• observed performance related to correct: – identification of parts – description of the power flow – explanation of the shifting control. *Assessment Tool* *Automatic Transmissions: Part 1, MEC313–1* *Standard* *Performance rating of 3 on each criteria*	20

MODULE MEC313: AUTOMATIC TRANSMISSIONS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • complete inspection, diagnostic, service and repair procedures on automatic transmissions and transaxle assemblies	*Assessment of student achievement will be based on:* • observed performance related to: – procedures followed during inspection, diagnosis, service and repair to automatic transmissions and transaxles – analysis of conditions that caused wear/malfunctions to automatic transmissions and/or transaxles. *Assessment Tool* *Automatic Transmissions: Part 2, MEC313–1* *Standard* *Performance rating of 3 on each criteria*	65
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow established lab procedures.	
Identify/Function	• describe the operation of a torque converter • differentiate between lock-up converter and non-lock-up converter operation by comparing the internal structure of each • identify the parts of the transmission assembly in generic terminology by naming pieces on a diagram or parts of a disassembled unit • using a hydraulic flow diagram, explain the unit engaged as well as shift process for each gear position	

MODULE MEC313: AUTOMATIC TRANSMISSIONS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • interpret shifting characteristics resulting from differentiated inputs; e.g., high road speed, pulling heavy loads, throttle valve position.	
Inspect/Service	• use service manuals and road test to determine probable causes of noted conditions • initiate diagnostic procedures developed from service inquiry, which may include linkage adjustments, pressure testing and further road testing as well as partial disassembly of the transmission • perform a stall test • list parts for required repairs. • inspect transmission/transaxle oil level and develop an assessment of its smell and colour • change transmission fluid and filter as described in the appropriate service manual • check unit for oil leakage and determine a cause for loss of oil • repair a fluid leak • evaluate the condition and adjustment of linkage • locate and correct a transmission linkage or band adjustment where required • remove, clean and reinstall a transmission valve body assembly.	For example, oil pan and/or valve body removal. According to manufacturer's specifications. Cost estimate may be done.
Inspect/Repair	• remove and repair or replace an automatic transmission assembly.	May require Career Transitions module for a customer vehicle.
Careers	• identify further education and work opportunities related to automatic transmissions.	

MODULE MEC314: POWER TRAIN REPAIR

Level: **Advanced**

Theme: **Guidance and Control Systems**

Prerequisites: **Power Trains (MEC213)**
Manual Transmissions and Transaxles (MEC214; recommended)

Module Parameters: **Access to specialized power train tools supporting resources and power train units**

Students perform overhauls on clutch, transmission and differential assemblies.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established safe practices	• observed performance related to: – safe practices using equipment, tools, materials and while working in lab. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	10
• replace clutch assembly	• measured performance related to clutch: – following shop procedures – following procedures in shop manuals – accuracy and quality of work. *Assessment Tool* *Power Train Repair: Part 1, MEC314–1* *Standard* *Performance rating of 3 on each criteria*	15
• remove, overhaul and replace standard transmissions	• observed performance related to transmissions: – following shop procedures – following procedures in shop manuals – accuracy and quality of work. *Assessment Tool* *Power Train Repair: Part 2, MEC314–1* *Standard* *Performance rating of 3 on each criteria*	35

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• measure and adjust a differential assembly	• observed performance related to differentials: – accurate measurements – accurate adjustments – finding and following manufacturers specifications – information retrieval. *Assessment Tool* *Power Train Repair: Part 3, MEC314–1* *Standard* *Performance rating of 3 on each criteria*	15
• overhaul drive axle assembly (CV joints)	• measured performance related to drive axles: – following shop procedures – accurate removal and overhaul of parts. *Assessment Tool* *Power Train Repair: Part 4, MEC314–1* *Standard* *Performance rating of 3 on each criteria*	25
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow established lab procedures.	Refer to asbestos hazards.
Identify/Function	• explain the operation and power flow in various transmissions and transaxles • describe drive axle operation and components of four wheel, front wheel and rear wheel drives	

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • describe types of differential assemblies and explain operation of the following: – full floating – semi-floating – hunting – non-hunting • describe the operation of a limited slip differential assembly	
Inspect/Service and Repair	• remove and replace a clutch assembly • determine the serviceability of each part • adjust linkage to specified clearance • remove and replace specified transmission and overhaul to manufacturer's specifications • overhaul constant velocity joints • measure and adjust a differential assembly.	
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC315: WHEEL ALIGNMENT

Level: **Advanced**

Theme: **Suspension and Structural Systems**

Prerequisites: **Suspension Systems (MEC215)**
Steering Systems (MEC216; recommended)

Module Parameters: **Access to wheel alignment equipment and supporting resources**

Students develop the knowledge, skills and attitudes necessary for the alignment of various steering systems used on vehicles.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• follow established safe practices	• observed performance related to: – safe practices for personal safety – safe practices for vehicles. *Assessment Tool* *Health and Safety, MECHS–1* *Standard* *Performance rating of 3 on each criteria*	10
• investigate and determine the condition of the various components affecting wheel alignment and correct as necessary	• measured performance related to pre-alignment: – determining the condition of steering components – determining the condition of suspension components – applying procedures and practices. *Assessment Tool* *Wheel Alignment: Part 1, MEC315–1* *Standard* *Performance rating of 3 on each criteria*	25
• identify measurements and angles that are incorporated into suspension and steering systems	• observed performance related to: – identification and measurement of angles – identifying angle adjustment methods – indicating effects of incorrect angles on vehicle handling and components. *Assessment Tool* *Wheel Alignment: Part 2, MEC315–1* *Standard* *Performance rating of 3 on each criteria* *Illustrative Example: Wheel Alignment, MEC315–2*	25

MODULE MEC315: WHEEL ALIGNMENT (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• use specialized alignment equipment to check and adjust alignment angles to manufacturer's specifications on various suspension types	• observed performance related to adjusting alignment angle: – information retrieval – accurate measurements – application of skills and knowledge – correct use of special tools/equipment. *Assessment Tool* *Wheel Alignment: Part 3, MEC315–1* *Standard* *Performance rating of 3 on each criteria*	30
• perform a road test and determine the quality of service work performed	• observed performance related to: – assessment of the work done – analysis of driving symptoms – care and safety procedures. *Assessment Tool* *Wheel Alignment: Part 4, MEC315–1* *Standard* *Performance rating of 3 on each criteria*	10
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures.	
Identify/Function	• define and explain camber, caster, toe, steering axis inclination, toe-out on turns and tracking.	

MODULE MEC315: WHEEL ALIGNMENT (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze	*The student should:* • be able to solve common steering and suspension problems; e.g., – loose steering – hard steering – vehicle wander – vehicle pulls to one side – wheel shimmy – wheel tramp – improper tire wear.	
Inspect/Service	• check and correct tire pressures and determine reason for abnormal tire wear • check and adjust wheel bearings • check and adjust wheel/tire run out • check and correct tire balance • check and correct steering linkage problems • check and adjust steering gear • check and correct shock absorber problems • check and correct riding height • check vehicle tracking • using alignment equipment, check alignment angles for a given vehicle • using alignment equipment, adjust alignment angles to manufacturer's specifications on at least two different suspension types • through a road test, determine whether proper steering and ride exists.	
Careers	• identify further education and work opportunities related to wheel alignment.	

MODULE MEC316: BODY REPAIR ESTIMATION

Level: **Advanced**

Theme: **Suspension and Structural Systems**

Prerequisite: **Vehicle Structures and Materials (MEC116; recommended)**

Module Parameters: **Access to supporting resources**

Students learn the value of detail in the determining of cost of repair and acquire knowledge in estimating.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• state the role of insurance in industry and legal obligations involved in estimating	• presentation showing knowledge of terms: – "insurance" – "liability" – "waiver" – "write-off" – "premium"/"deductible". *Assessment Tool* *Body Repair Estimation: Part 1, MEC316–2* *Standard* *Performance rating of 3 on each criteria*	10
• investigate and acquire knowledge of vehicle construction and part costs	• presentation of a report showing knowledge of: – collision damage/direct – hidden damage – accessory parts – parts sources and prices (OEM versus aftermarket) – problem solving of damage owing to collision. *Assessment Tool* *Body Repair Estimation: Part 2, MEC316–2* *Standard* *Performance rating of 3 on each criteria*	20

MODULE MEC316: BODY REPAIR ESTIMATION (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate skills needed to successfully "estimate" collision damage	• demonstration/observed knowledge of methods needed to estimate, including: – visual frame damage analysis – accessory parts knowledge – mathematics skills required for cost analysis. *Assessment Tool* *Body Repair Estimation: Part 3, MEC316–2* *Standard* *Performance rating of 3 on each criteria*	25
• complete an estimate to automobile industry standards, including decision on replacement or repair	• given a damaged vehicle, students will perform and demonstrate: – problem-solving ability in determining cost of repair – knowledge of vehicle value versus repair cost – industry standard of estimate of repair including parts, labour costs, shop costs, miscellaneous costs. *Assessment Tool* *Body Repair Estimation: Part 4, MEC316–2* *Standard* *Performance rating of 3 on each criteria* *Illustrative Example: Body Repair Estimation, MEC316–2*	45
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

MODULE MEC316: BODY REPAIR ESTIMATION (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures. • demonstrate knowledge of mechanical and electrical components generally damaged in collision and state appropriate safety precautions in dealing with gas, oil, air conditioning and acid	
Identify/Analyze	• know the terms used in the appraisal industry • investigate vehicle construction systems (unibody and framed) and safety requirements • examine the effects of collision on vehicle structure, parts and passengers • demonstrate the effects of forces on metal and show how manufactured techniques are used to absorb collision energy • define the terms "primary damage", "secondary damage" and "hidden damage" • identify relate damaged parts • investigate collision damage incurred to: – determine direction of damage – list part damaged (including hidden damage) – list signs of hidden damage and physically remove appropriate parts to further the investigation • conduct tests to determine mechanical and/or electrical functions in order to properly estimate cost of collision damage • provide cost analysis including parts, labour and miscellaneous.	

Concept	Specific Learner Expectations	Notes
Identify/Analyze (continued)	*The student should:* • investigate the cost of OEM, after market and used parts that could be used in a repair • complete a replacement parts list for a given collision, including "cost", "extended cost", and "contracted" costs • list examples of hidden and "other" costs that must be included in an estimate of collision damage • describe the responsibility of the shop to the customer, the insurer and legal parties in doing an estimate; e.g., safety of vehicle • define "write-off" and explain when a vehicle is considered a write-off and non-repairable • explain the advantages of vehicle structure and repair knowledge when completing an estimate for repair.	
Careers	• identify further education and work opportunities related to body repair estimation.	

MODULE MEC317: STRUCTURAL DAMAGE ANALYSIS

Level: **Advanced**

Theme: **Suspension and Structural Systems**

Prerequisites: **Suspension Systems (MEC215) and/or Steering Systems (MEC216; recommended)**

Module Parameters: **Access to damaged vehicle, measuring gauges and related resources**

Students identify and examine physical damage caused by collision, including cost estimating procedures.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established safe procedures	• observed performance related to: – safe positioning of vehicle jacks and jack stands – following shop routines in removal of parts. *Assessment Tool* *Structural Damage Analysis: Part 1, MEC317–1* *Standard* *Performance rating of 3 on each criteria*	10
• identify types and signs of damage caused by collision	• presentation of a report describing: – vehicle construction and safety features preventing collision damage – frame types and related damage – signs of secondary and hidden damage – methods used to determine damage. *Assessment Tool* *Structural Damage Analysis: Part 2, MEC317–1* *Standard* *Performance rating of 3 on each criteria*	15

MODULE MEC317: STRUCTURAL DAMAGE ANALYSIS (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• examine and successfully use measurement methods to determine extent of damage	• given a damaged vehicle, the student will perform the necessary measurements to show: – direction and extent of damage – suspension problems that might exist. *Assessment Tool* *Structural Damage Analysis: Part 3, MEC317–1* *Standard* *Performance rating of 3 on each criteria*	30
• prepare a repair strategy for a given vehicle	• given a damaged vehicle, the student will perform and demonstrate: – problem-solving ability in determining cost of repair – knowledge of vehicle value versus repair costs – industry standard estimate of repair including parts, labour and shop costs. *Assessment Tool* *Structural Damage Analysis: Part 4, MEC317–1* *Standard* *Performance rating of 3 on each criteria*	45
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow established lab procedures.	

MODULE MEC317: STRUCTURAL DAMAGE ANALYSIS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function	*The student should:* • examine the manufacturer's methods used in vehicle construction; learn the terminology used to identify vehicle body parts • investigate methods used in vehicle construction to control damage through energy transfer and differences in strength • identify the specific occupant safety features built into the vehicle as required by law or provided as an option.	
Inspect/Report	• demonstrate basic principles of estimating damage repair and apply to a specific situation • estimate repair or replacement of safety equipment damaged in a collision • examine the basic frame structures used in auto construction, and the measurement charts used to determine misalignment • conduct frame alignment measurements to determine extent of misalignment and explain the results of the measurements • use frame gauges and charts • analyze measurements and determine repair procedure • examine the value of using used, after market or OEM parts in any given repair • complete a damage analysis for a given vehicle • explain when a vehicle is considered a "write-off" • prepare strategy plan showing correct repair sequence.	ABS, air bag, suspension and personal restraint systems.
Careers	• explore further education and work opportunities related to structural damage analysis.	

MODULE MEC318: STRUCTURAL DAMAGE REPAIR I

Level: **Advanced**

Theme: **Suspension and Structural Systems**

Prerequisites: **Metal Forming and Finishing (MEC117)**
Structural Damage Analysis (MEC317; recommended)

Module Parameters: **Access to specialized body tools, hand tools and related resources.**

Instructional Qualification: **The student must have access to instruction from an individual with journeyman qualifications if students are involved in customer work**

Students complete a repair involving removal, replacement and alignment of body parts.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established safety procedures	• observed performance related to the safe handling and use of tools and equipment. *Assessment Tool* *Structural Damage Repair 1: Part 1, MEC318–1* *Standard* *Performance rating of 3 on each criteria*	10
• follow an approved sequence of repair involving removal and replacement of damaged external parts	• observed performance in: – organizing work and work site – analyzing correct repair sequence – removal of parts and accessories required *Assessment Tool* *Structural Damage Repair 1: Part 2, MEC318–1* *Standard* *Performance rating of 3 on each criteria*	25

MODULE MEC318: STRUCTURAL DAMAGE REPAIR I (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• align parts used in repair and prepare for paint or priming	• observed performance related to the ability to: – repair parts that can be repaired – replace parts and correctly align showing knowledge of alignment principles. *Assessment Tool* *Structural Damage Repair I: Part 3, MEC318–1* *Standard* *Performance rating of 3 on each criteria*	40
• remove, repair or replace trim parts as required	• observed performance in: – problem solving damage – listing parts and/or repairs required – listing cost of repair and making cost effective decision – replacing or repairing trim. *Assessment Tool* *Structural Damage Repair I: Part 4, MEC318–1* *Standard* *Performance rating of 3 on each criteria*	25
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tools* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow established lab procedures. • follow approved safety procedures in the use of jacks, jack stands, impact wrenches, torches, plasma arcs and abrasive cutters in the replacement of parts	Consideration must be given to techniques that prevent damage to adjacent surfaces or parts.

MODULE MEC318: STRUCTURAL DAMAGE REPAIR I (continued)

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards (continued)	*The student should:* • demonstrate knowledge, skills and attitudes in the use of hand tools, and performing correctness of task.	
Inspect/Report	• examine collision to external parts and determine appropriate repair sequence • complete a list of required parts and show cost-effectiveness of using aftermarket or used parts • list methods used in the manufacture of vehicles to align adjacent parts, including shims, slotted holes and bending • examine the bumper shock system and explain the effects of collision to "bumper shocks" and their alignment • describe the importance of correct alignment of body parts and the effects of "misalignment", both aesthetically and physically • understand the function of trim • examine methods of trim fastening	
Inspect/Repair	• successfully remove trim and damaged parts, showing knowledge of tools and care for property • demonstrate skill and patience in the preparation of existing flanges, edges and mounting points used for replacement of new parts • safely remove and replace a door, hood and/or trunk lid • replace and align a fender • remove and install trim and recognize the value of using OEM trim parts.	
Careers	• identify further education and work opportunities related to structural damage repair.	

MODULE MEC319: STRUCTURAL DAMAGE REPAIR II

Level: **Advanced**

Theme: **Suspension and Structural Systems**

Prerequisites: **Suspension Systems (MEC215)**
Steering Systems (MEC216)
Metal Repair and Finishing (MEC217)
Surface Preparation II (MEC219)
Structural Damage Repair I (MEC318; recommended)

Module Parameters: **Access to hydraulic push/pull equipment, MIG and cutting equipment, basic body tools and related resources**

Instructional Qualification: **The students must have access to instruction from an individual with journeyman qualifications if students are involved in customer work**

Students examine the methods used to complete a collision repair that involves unibody parts replacement and frame correction.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate established safety procedures	• observed performance related to the safe handling of vehicles in repair. *Assessment Tool* *Structural Damage Repair II: Part 1, MEC319–1* *Standard* *Performance rating of 3 on each criteria*	10
• understand construction of vehicle bodies and methods of repair	• presentation of a report describing vehicle construction, showing knowledge of: – HSS/HSLA metals – unibody construction – frame construction – methods used to repair vehicle bodies. *Assessment Tool* *Structural Damage Repair II: Part 2, MEC319–1* *Standard* *Performance rating of 3 on each criteria*	10

MODULE MEC319: STRUCTURAL DAMAGE REPAIR II (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• examine and use a "bench" frame straightening system and related measurements	• observed performance in using "frame" equipment, including knowledge of "measurement" charts and parts terminology. *Assessment Tool* *Structural Damage Repair II: Part 3, MEC319–1* *Standard* *Performance rating of 3 on each criteria*	15
• determine misalignment of frame and suspension	• observed performance given a damaged vehicle, the student will demonstrate: – problem solving/analyzing existing misalignment – selecting resources to assist in repair analysis – understanding of suspension geometry. *Assessment Tool* *Structural Damage Repair II: Part 4, MEC319–1* *Standard* *Performance rating of 3 on each criteria*	25
• correct frame/body alignment involving replacement of unibody panels and use of hydraulic jacks and welders	• observed performance related to: – use of hydraulic push/pull equipment – unibody panel replacement – welding and cutting tool use – alignment and fabrication of damaged parts. *Assessment Tool* *Structural Damage Repair II: Part 5, MEC319–1* *Standard* *Performance rating of 3 on each criteria*	25
• explain the importance of proper frame and suspension alignment including legal implications	• ability to identify suspension parts and problems incurred by misalignment owing to collision. *Assessment Tool* *Structural Damage Repair II: Part 6, MEC319–1* *Standard* *Performance rating of 3 on each criteria*	15

MODULE MEC319: STRUCTURAL DAMAGE REPAIR II (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will: • demonstrate basic competencies.	*Assessment of student achievement will be based on:* • observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow lab safety procedures. • practise safety procedures required in the use of hydraulic jacks, MIG welding and cutting equipment • list the safety implications of collision damage causing suspension misalignment, including legal implications.	
Identify/Function	• investigate and describe three kinds of frame structures, giving the advantages and applications of each • define the terms HSS and HSLA, and explain the need for these metals in unibody construction • explore the "bench system" used by professional auto repair shops in unibody collision repair • describe the use of measurements and measurement charts in determination of misalignment • define terms: "twist", "sag", "sway" and "diamond" • analyze measurements that will indicate each of the above conditions.	

MODULE MEC319: STRUCTURAL DAMAGE REPAIR II (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze	*The student should:* • describe the correct procedure used to repair a unibody frame that shows misalignment • learn the use of hydraulic jacking systems in the repair of collision damage • identify three kinds of suspension systems used by auto makers • define terms: "toe-in", "camber", "castor" and explain how each affects car tracking and drive ability	
Inspect/Repair	• uses a bench frame straightening system to correct alignment • align and fabricate damaged parts.	
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC320: REFINISHING II

Level: **Advanced**

Theme: **Suspension and Structural Systems**

Prerequisite: **Refinishing I (MEC220)**

Module Parameters: **Access to spray equipment, surface repair equipment and related resources**

Students demonstrate knowledge and skills of advanced finishing techniques including custom painting, mixing, tinting, colour and texture matching.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• demonstrate safe practices and follow all explicit warnings identified by the manufacturer and Occupational Health and Safety	• observed performance related to: – safe handling of chemicals and paint products – knowledge of potential dangers with improper use – proper use of resources (WHMIS/MSDS) – follow shop routines for painting. *Assessment Tool* *Refinishing II: Part 1, MEC320–1* *Standard* *Performance rating of 3 on each criteria*	15
• investigate advanced products, techniques and equipment used in obtaining acceptable OEM finish	• presentation of a report demonstrating knowledge of: – base/clear systems – plastic coatings – colour matching using colour-code references. *Assessment Tool* *Refinishing II: Part 2, MEC320–1* *Standard* *Performance rating of 3 on each criteria*	25

MODULE MEC320: REFINISHING II (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• apply an advanced type refinish	• observed performance in application of overall refinish product in a special situation: – tutone – striped – custom. *Assessment Tool* *Refinishing II: Part 3, MEC320–1* *Standard* *Performance rating of 3 on each criteria*	60
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
	The student should:	
Health/Safety Hazards	• know health hazards and environmental impacts of products used.	Supplier recommendations.
Identify/Function	• have knowledge of alternate spray equipment	Airless spray gun, electro static, air brushes, touch-up gun.
	• understand types and use of spray booths	Type, maintenance.
	• have knowledge of compressors, drying systems	
	• research styles and techniques of custom painting	
	• have knowledge of mixing and tinting systems.	Tour body shop and/or post-secondary institute.

MODULE MEC320: REFINISHING II (continued)

Concept	Specific Learner Expectations	Notes
Identify/Function (continued)	*The student should:* • analyze colour/texture and recognize the following: – lightness/darkness – cast – brightness • have a knowledge of colour tinting • have knowledge/application of textured finishes.	Matching colours and metallics. Rock guard, spatter finishes.
Inspect/Repair	• demonstrate advanced application techniques • perform advanced troubleshooting of application/equipment problems • demonstrate proper selection and application of colour coats for plastic and vinyls.	Application consistency, improved gun control. Bumper paint, vinyl roofs.
Careers	• explore further education, work conditions and opportunities.	

MODULE MEC321: PLASTIC AND FIBREGLASS

Level: **Advanced**

Theme: **Suspension and Structural Systems**

Prerequisite: **Vehicle Structure and Materials (MEC117; recommended)**

Module Parameters: **Access to plastic welding equipment and related materials and resources**

Students determine the type of plastic/fibreglass material and perform the repair procedure.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• identify hazards and safety precautions to be observed when working with plastics	• presentation of a report identifying observed performance related to: – use of plastic repair materials – personal safety requirements – following appropriate safety roles. *Assessment Tool* *Plastic and Fibreglass: Part 1, MEC321–1* *Standard* *Performance rating of 3 on each criteria*	10
• describe the types of plastics, weld equipment and bond processes to be used in repairing specific plastics	• preparation of a chart indicating: – plastic types – repairability – materials required for repair – precautions for safety. *Assessment Tool* *Plastic and Fibreglass: Part 2, MEC321–1* *Standard* *Performance rating of 3 on each criteria*	15
• do a plastic weld and bond	• observed performance in completion of a plastic repair. *Assessment Tool* *Plastic and Fibreglass: Part 3, MEC321–1* *Standard* *Performance rating of 3 on each criteria*	30

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• identify types of fibreglass material and repair procedures	• ability to identify three kinds of fibreglass material and related resins/hardeners: – describe procedures necessary for repair. *Assessment Tool* *Plastic and Fibreglass: Part 4, MEC321–1* *Standard* *Performance rating of 3 on each criteria*	10
• do a fibreglass repair	• observed performance in the completion of a repair: – using safe handling techniques – proper preparation of repair area – correct application of material – following approved finishing steps. *Assessment Tool* *Plastic and Fibreglass: Part 5, MEC321–1* *Standard* *Performance rating of 3 on each criteria*	35
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • follow accepted safety practices when working with hot liquids, plastic solvents, resins and equipment.	WHMIS Ventilation.

MODULE MEC321: PLASTIC AND FIBREGLASS (continued)

Concept	Specific Learner Expectations	Notes
Identify/Analyze	*The student should:* • identify and state characteristics of plastics used in vehicle manufacture • identify plastics that can be welded and those that can be bonded • know the types of plastic welding equipment available and when this repair process should be used • identify welding rods • know which adhesives are available and their application • after identifying plastic, determine whether to weld or bond • state why a particular process was chosen.	
Inspect/Repair	• determine correct layout • prepare "witness lines" for repeat layout • prepare/clean plastic material as per instructions for process used • create a solid lay-up • weld material • bond material • prepare damaged area • prepare material • apply material.	
Careers	• research how prevalent plastic repairs are in industry.	

MODULE MEC322: GLASS REMOVAL AND INSTALLATION

Level: **Advanced**

Theme: **Suspension and Structural Systems**

Prerequisite: **Trim Removal and Installation (MEC218; recommended)**

Module Parameters: **Access to glass removal tools, related materials/resources and glazed vehicles**

Students gain knowledge, skill and practice related to vehicle glass installation and adjustment.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• safely handle glass and related materials	• observed performance related to: – clean-up/disposal of damaged glass – safety procedures required – proper handling of installation materials. *Assessment Tool* *Glass Removal and Installation: Part 1, MEC322–1* *Standard* *Performance rating of 3 on each criteria*	10
• identify glass types and retaining systems	• presentation of a report describing: – glass retaining systems – molding and seals – glass types and functions of glass. *Assessment Tool* *Glass Removal and Installation: Part 2, MEC322–1* *Standard* *Performance rating of 3 on each criteria*	15
• show knowledge of tools and procedures used by glass technicians	• observed performance related: – identification and use – following instructions as given by specific manufacturer's manuals – proper installation and testing procedures. *Assessment Tool* *Glass Removal and Installation: Part 3, MEC322–1* *Standard* *Performance rating of 3 on each criteria*	20

MODULE MEC322: GLASS REMOVAL AND INSTALLATION (continued)

Module Learner Expectations	Assessment Criteria and Conditions (Draft)	Suggested Emphasis
The student will:	*Assessment of student achievement will be based on:*	
• complete glass removal installations and adjustments	• observed performance in completion of: – front or rear glass removal/replacement – side glass removal/installation adjustment – sealing and testing installation performed. *Assessment Tool* *Glass Removal and Installation: Part 4, MEC322–1* *Standard* *Performance rating of 3 on each criteria*	55
• demonstrate basic competencies.	• observations of individual effort and interpersonal interaction during the instructional period. *Assessment Tool* *Basic Competencies Reference Guide and any assessment tools noted above*	Integrated throughout

Concept	Specific Learner Expectations	Notes
Health/Safety Hazards	*The student should:* • identify safety concerns when working with glass • show knowledge of safety procedures needed in glass removal • identify installation product safety concerns in the glass industry.	
Identify/Function	• identify types of glass and retaining systems used in auto industry • outline the removal procedures required for different systems • show knowledge of trim parts used around glass • identify molding retainers, glass seal products and procedures for installation • identify door glass adjustment methods	

MODULE MEC322: GLASS REMOVAL AND INSTALLATION (continued)

Concept	Specific Learner Expectations	Notes
Inspect/Repair	*The student should:* • remove front or rear glass following safety guidelines • install several glass systems, including door glass and side lights • adjust door glass on several different systems.	Refer to manufacturer's specifications for front and rear glass installations to provide vehicle integrity.
Careers	• identify further education and work opportunities related to vehicle glass removal and installation.	

MECHANICS

SECTION G: ASSESSMENT TOOLS

(DRAFT)

TABLE OF CONTENTS

The following pages include background information and strategies for assessing student achievement and the assessment tools that are listed in Sections D, E and F of this Guide.

This section of the Guide to Standards and Implementation has been designed to provide a common base of understanding about the level of competencies students are expected to demonstrate to successfully complete a module. The goal is to establish assessment standards for junior and senior high school students that are fair, credible, and challenging.

These tools will assist teachers throughout the province to more consistently assess student achievement. The purpose of expanding on the assessment standards is to:

- increase confidence among students, parents, business/industry and post-secondary that students can demonstrate the competencies specified in the modules they have completed
- encourage fairness and equity in how students' efforts are judged
- enable learners to focus effort on key learnings
- support teachers and community partners in planning and implementing CTS.

These tools are in draft form and are being validated between now and 1997 during the optional stage of CTS implementation.

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ASSESSING STUDENT ACHIEVEMENT IN CTS

The CTS assessment standards assess two basic forms of competency:

- What a student **can *do***?
  - **make** a product (e.g., wood bowl, report, garment)
  - **demonstrate** a process
    - strand-related competencies (e.g., keyboarding, hair cutting, sewing techniques, lab procedures)
    - basic competencies (e.g., resource use, safety procedures, teamwork).

- What a student ***knows***?
  - knowledge base needed to demonstrate a competency (link theory and practice).

CTS Defines *Summative* Assessment Standards

The assessment standards and tools defined for the CTS modules, referenced in Sections D, E and F of this Guide, focus on the final (or summative) assessment of student achievement.

Assessment throughout the learning period (or formative assessment) will continue to assess how students are progressing. Teachers direct and respond to students' efforts to learn—setting and marking tasks and assignments, indicating where improvement is needed, sending out interim reports, congratulating excellence, etc.

Teachers will decide which instructional and assessment strategies to apply during the formative learning period. As formative and summative assessment are closely linked, some teachers may wish to modify the tools included in this section to use during the instructional process. Teachers may also develop their own summative assessment tools as long as the standards are consistent with the minimum expectations outlined by Alberta Education.

Grading and Reporting Student Achievement

When a student can demonstrate ALL of the exit-level competencies defined for the module (Module Learner Expectations), the teacher will designate the module as "successfully completed." The teacher will then use accepted grading practices to determine the percentage grade to be given for the module—a mark not less than 50%.

The time frame a teacher allows a student to develop the exit-level competency is a local decision. NOTE: The Senior High School Handbook specifies that students must <u>have access to 25 hours of instruction</u> for each credit. Students may, however, attain the required competencies in less time and may proceed to other modules.

Teachers are encouraged to consult their colleagues to ensure grading practices are as consistent as possible.

High school teachers may wish to refer to "Directions for Reporting Student Achievement in CTS" for information on how to use the CTS course codes to report credits students have earned to Alberta Education. (Copies of this document have been forwarded to superintendents and senior high school principals.)

Components of Assessment Standards in CTS

The following components are included in each module:

- **module learner expectations** (shaded left column of the module) define the exit-level competencies students are expected to achieve to complete a module. Each MLE defines and describes critical behaviours that can be measured and observed. The student must meet the standard specified for <u>ALL</u> MLEs within a module to be successful. *(MLEs will not change until 1997 when minor adjustments may be made to update and clarify wording.)*

- **suggested emphasis** (right column of the module) provides a guideline for the relative significance of each MLE and can be used to organize for instruction. *(In draft until early 1997, revisions to selected modules will be distributed in June 1995 and 1996 with final revisions in June 1997.)*

- **conditions and criteria** (middle column of the module) set the framework for the assessment of student competency, specifying the minimum standard for performance and including a reference to assessment tools, where appropriate. *(In draft until early 1997, revisions to selected modules will be distributed in June 1995 and 1996 with final revisions in June 1997.)*

  Conditions outline the specifications under which a student's competency can be judged. For example, the conditions could specify whether the assessment should be timed or not, or if the student should be allowed to access to support resources or references.

  Criteria define the behaviours that a student must demonstrate to meet the designated standard. For example, the criteria could describe the various techniques that must be demonstrated when using a tool, and/or describe the minimum components of a project the student must complete.

  Standard may be defined by (1) assessment tools, which are referenced in this section (or sometimes in approved learning resources) and/or (2) "illustrative examples" of student work (to be developed and distributed in June 1997).

  Assessment Tools included in this section of the Guide tend to be of two types:

  - tools generic to a strand or to the entire CTS program; e.g., a standard 5-point rating scale is used in all strands. Other generic tools include assessing reports and presentations and lab safety checklists. *(Names of these tools include the strand code (e.g., "INF" for Information Processing) and a code for the type of tool (e.g., "TDENT" for Text-Data Entry).)*

  - tools specific to a module; e.g., assessment checklist for assessing a venture plan in Enterprise and Innovation or a checklist for sketching, drawing and modelling in Design Studies. *(Names of these tools include the module code; e.g., "INF101-1" indicating that it is the first module-specific tool used in Information Processing Module 101.)*

  - Illustrative Examples: Selected examples of student work in print, audio, video and/or CD-ROM formats are scheduled to be available by June 1997. These examples will supplement the assessment tools and help teachers decide if a student's work is at standard, above standard, or not yet at standard.

Development and Validation Processes

The "Conditions and Criteria" and "Suggested Emphasis" columns are being validated 1994–97, with extensive input from teachers, professional associations/contacts and post-secondary institutions. The goal is to prepare well-structured assessment standards and related assessment tools that:

- establish an appropriate level of challenge and rigour
- relate directly to the type of learning described in the curriculum standard
- are easy to understand
- are efficient to implement
- can provide a consistent measure of what was expected to be measured.

ASSESSING STUDENT ACHIEVEMENT IN MECHANICS

The Mechanics curriculum supports the principles of results-based curriculum in the way curriculum is structured, the type and range of learnings afforded to students and the manner in which they can be measured or assessed. Each modules identifies criteria and conditions for each module learner expectation with a suggested emphasis within that particular module. These aspects provide for a framework for student learning and assessment with a great deal of consistency.

Assessment Strategies and Tools

In the following section, a number of different tools are provided for Mechanics facilitators, either as a reference or applied for specific assessment purposes. The intent is to provide guidance to teachers in assessing student work with a standard that is fair to students and also will be recognized by stakeholder groups as valid. This will provide students with linkages to further learnings or the workplace.

In CTS, assessment tools are intended to be used for summative assessment, assessment when student has completed requirements for particular Module Learner Expectations. Teachers will still be required to assess throughout the learning period (formative assessment) and tools can be modified to accomplish this end or new tools developed. Teachers can best gauge which instructional and assessment strategies to apply during the formative learning period.

Tools Generic to Mechanics

Generic tools have been developed for basic competencies, laboratory practice and presentations/reports, customer service and career exploration. It is intended that the basic competencies are integrated throughout the program whereas customer service and career exploration are applied as assessment strategies dictate. The laboratory practice tools will provide specific assessment in laboratory related learning and will assist in showing competency progression from introductory to advanced levels. Presentations/reports assessment tools are applied to theoretical components of the curriculum and provide consistency in assessing those aspects but not necessarily dictating a particular process.

Tools Specific to Mechanics

Tools have also been developed to assess specific MLEs in a module and are labelled with the module number and tools number; e.g., MEC101–1.

These assessment tools outline the criteria for assessment and provide the minimum standard to which the student must perform tasks or processes. It should be noted that a scale of 0–4 is utilized and generally, the following minimum standards apply: introductory level = 1, intermediate level = 2, and advanced level = 3.

Suggested Emphasis for Assessment

The *Suggested Emphasis* column indicates to students and teachers the relative importance of each MLE in reference to the total module and assists teachers in organizing for instruction.

BASIC COMPETENCIES REFERENCE GUIDE

(This checklist is still being validated)

The following chart outlines basic competencies which students will endeavor to develop and enhance in each of the CTS strands and modules. Students' basic competencies should be assessed through observations involving the student, teacher(s), peers and others as they complete the requirements for each module. In general, there is a progression of task complexity and student initiative as outlined in the Development Framework*. **As students progress through the Stages 1, 2, 3 and 4 of this reference guide, they build on the competencies gained in earlier stages.** Students leaving high school should set themselves a goal of being able to demonstrate Stage 3 performance.

Suggested strategies for classroom use include:

- having students rate themselves and each other
- using for a reflective conversation between teacher and student
- highlighting areas of strength
- tracking growth in various CTS strands
- highlighting areas upon which to focus
- including in student's portfolio

Stage 1— *The student:*	Stage 2— *The student:*	Stage 3— *The student:*	Stage 4— *The student:*
Managing Learning			
☐ comes to class prepared for learning	☐ →	☐ →	☐ →
☐ follows basic instructions as directed	☐ follows instructions with limited direction	☐ follows detailed instructions on an independent basis	☐ →
	☐ sets goals and establishes steps to achieve them with direction	☐ sets clear goals and establish steps to achieve them	☐ demonstrates self-direction in learning, goal setting and goal achievement
☐ acquires specialized knowledge, skills and attitudes	☐ applies specialized knowledge, skills and attitudes in practical situations	☐ transfers and applies specialized knowledge, skills and attitudes in a variety of situations	☐ transfers and applies learning in new situations; demonstrates commitment to life-long learning
☐ identifies criteria for evaluating choices and making decisions	☐ identifies and applies a range of effective strategies for solving problems and making decisions	☐ uses a range of critical thinking skills to evaluate situations, solve problems and make decisions	☐ thinks critically and acts logically to evaluate situations, solve problems and make decisions
☐ uses a variety of learning strategies	☐ explores and uses a variety of learning strategies with limited direction	☐ selects and uses effective ☐ learning strategies ☐ cooperates with others in the effective use of learning strategies	☐ → ☐ provides leadership in the effective use of learning strategies
Managing Resources			
☐ adheres to established timelines; uses time/schedules/planners effectively	☐ creates and adheres to timelines with limited direction; uses time/schedules/planners effectively	☐ creates and adheres to detailed timelines on an independent basis; prioritize task; use time/schedules/planners effectively	☐ creates and adheres to detailed timelines; use time/schedules/planners effectively, prioritizing tasks on a consistent basis
☐ uses information (material and human resources) as directed	☐ accesses and uses a range of relevant information (material and human resources) with limited direction	☐ accesses a range of information (material and human resources) and recognizes when additional resources are required	☐ uses a wide range of information (material and human resources) in order to support and enhance the basic requirement
☐ uses technology (facilities, equipment, supplies) as directed to perform a task or provide a service	☐ uses technology (facilities, equipment, supplies) as appropriate to perform a task or provide a service with minimal assistance and supervision	☐ selects and uses appropriate technology (facilities, equipment, supplies) to perform a task or provide a service on an independent basis	☐ recognizes the monetary and intrinsic value of managing technology (facilities, equipment, supplies)
☐ maintains, stores, and/or disposes of equipment and materials as directed	☐ maintains, stores and/or disposes of equipment and materials with limited assistance	☐ maintains, stores and/or disposes of equipment and materials on an independent basis	☐ demonstrates effective techniques for managing facilities, equipment and supplies
Problem Solving and Innovation			
☐ participates in problem solving as a process ☐ learns a range of problem-solving skills and approaches	☐ identifies the problem and selects an appropriate problem-solving approach responding appropriately to specified goals and constraints	☐ thinks critically and acts logically in the context of problem solving	☐ identifies and resolves problems efficiently and effectively
☐ practices problem-solving skills by responding appropriately to a clearly defined problem, specified goals and constraints by: – generating alternatives – evaluating alternatives – selecting appropriate alternative(s) – taking action	☐ applies problem-solving skills to a directed or a self-directed activity by: – generating alternatives – evaluating alternatives – selecting appropriate alternative(s) – taking action	☐ transfers problem-solving skills to real-life situations by generating new possibilities ☐ prepares implementation plans ☐ recognizes risks	☐ identifies and suggest new ideas to get the job done creatively by: – combining ideas or information new ways – making connections between seemingly unrelated ideas – actively seeking out opportunities

Stage 1— *The student:*	Stage 2— *The student:*	Stage 3— *The student:*	Stage 4— *The student:*
Communicating Effectively			
☐ uses communication skills; e.g., reading, writing, illustrating, speaking	☐ communicates thoughts, feelings, and ideas to justify or challenges a position using written, oral and visual means	☐ prepares and effectively presents accurate, concise, written, visual and/or oral reports providing reasoned argument	☐ negotiates effectively by working towards an agreement that may involve exchanging specific resources or resolving divergent interests
☐ uses language in appropriate context	☐ uses technical language appropriately	☐ encourages, persuades, convinces or otherwise motivates individuals	☐ negotiates and works towards a consensus
☐ listens to understand and learn	☐ listens and responds to understand and learn	☐ listens and responds to understand, learn and teach	☐ listens and responds to understand, learn, teach and evaluate
☐ demonstrates positive interpersonal skills in selected contexts	☐ demonstrates positive interpersonal skills in many contexts	☐ demonstrates positive interpersonal skills in most contexts	☐ promotes positive interpersonal skills among others
Working with Others			
☐ fulfills responsibility in a group project	☐ →	☐ seeks a team approach as appropriate based on group needs and benefits e.g. idea potential, variety of strengths, sharing of work load	☐ leads, where appropriate; mobilizing the group for high performance
☐ works collaboratively in structured situations with peer members	☐ cooperates to achieve group results	☐ works in a team or group: – encourages and supports team members – helps others in a positive manner – provides leadership/ followership as required – negotiates and works toward consensus as required	☐ understands and works within the context of the group
☐ acknowledges the opinions and contributions of others in the group	☐ maintains a balance between speaking, listening and responding in group discussion ☐ respects the feelings and views of others		☐ prepares, validates and implements plans that reveal new possibilities
Demonstrating Responsibility			
Attendance			
☐ demonstrates responsibility in attendance, punctuality and task completion	☐ →	☐ →	☐ →
Safety			
☐ follows personal and environmental health and safety procedures	☐ recognizes and follows personal and environmental health and safety procedures	☐ establishes and follows personal and environmental health and safety procedures	☐ transfers and applies personal and environmental health and safety procedures to a variety of environments and situations
☐ identifies immediate hazards and their impact on self, others and the environment	☐ identifies immediate and potential hazards and their impact on self , others and the environment	☐ →	☐ →
☐ follows appropriate/emergency response procedures	☐ →	☐ →	☐ →
			☐ demonstrates accountability for actions taken to address immediate and potential hazards
Ethics			
☐ makes personal judgements about whether certain behaviour/ action is right or wrong	☐ assesses how personal judgements affect other peer members and/or family; e.g., home and school	☐ assesses the implications of personal/group actions within the broader community; e.g., workplace	☐ analyses the implications of personal/group actions within the global context ☐ states and defends a personal code of ethics as required

Developmental Framework★			
• *Simple task* • *Structured environment* • *Directed learning*	• *Task with limited variable* • *Less structured environment* • *Limited direction*	• *Task with multiple variables* • *Flexible environment* • *Self-directed learning, seeking assistance as required*	• *Complex task* • *Open environment* • *Self-directed/self-motivated*

GENERIC RATING SCALE

SCALE	RUBRIC STATEMENT (included in assessment tool/statements in *italics* are optional) *The student:*	IS TASK/ PROJECT COMPLETED?	PROBLEM SOLVING: STUDENT INITIATIVE VS TEACHER DIRECTION/ SUPPORT	USE OF TOOLS, MATERIALS, PROCESSES	*STANDARDS OF QUALITY/ PRODUCTIVITY*	*TEAMWORK LEADERSHIP*	*SERVICE CLIENT/ CUSTOMER*
O	has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.	Has not completed defined outcomes.		Tools, materials and/or processes are used inappropriately.			
1	meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services.*	Meets defined outcomes.	Follows a guided plan of action.	A limited range of tools, materials and/or processes are used appropriately.	*Quality and productivity are reasonably consistent.*	*Works cooperatively.*	*Provides a limited range of customer/client services.*
2	meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.*	Meets defined outcomes.	Plans and solves problems with limited assistance.	Tools, materials and/or processes are selected and used appropriately.	*Quality and productivity are reasonably consistent.*	*Works cooperatively to achieve team goals.*	*Identifies and provides customer/client services.*
3	meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.*	Meets defined outcomes.	Plans and solves problems in a self-directed manner.	Tools, materials and/or processes are selected and used efficiently and effectively.	*Quality and productivity are consistent.*	*Works cooperatively and contributes ideas and suggestions that enhance team effort.*	*Analyzes and provides effective client/customer services.*
4	exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.*	Exceeds defined outcomes.	Plans and solves problems effectively and creatively in a self-directed manner.	Tools, materials and/or processes are selected and used efficiently, effectively and with confidence.	*Quality, particularly details and finishes and productivity are consistent and exceed standards.*	*Leads others to contribute team goals.*	*Analyzes and provides effective client/customer services beyond expectations.*

INTRODUCTORY	INTERMEDIATE	ADVANCED
The student:	*The student:*	*The student:*
Preparation and Planning	**Preparation and Planning**	**Preparation and Planning**
• accurately describes an issue on which people disagree	• accurately describes an issue on which people disagree, explaining areas of disagreement	• accurately describes an issue on which people disagree, explaining specific causes of disagreement
• poses an important question regarding the issue	• poses one or more thoughtful questions regarding the issue	• poses thoughtful questions regarding the issue
• accesses basic in-school/community information sources regarding the issue	• accesses a range of relevant in-school/community resources	• accesses a range of relevant information sources and recognizes when additional information is required
• uses one or more information-gathering techniques	• uses a range of information-gathering techniques	• demonstrates resourcefulness in collecting data
Analyzing Perspectives	**Analyzing Perspectives**	**Analyzing Perspectives**
• clarifies different points of view regarding the issue; *e.g., social, economic, environmental*	• categorizes different points of view regarding the issue; *e.g., cultural, ethical, economic, environmental, health-related*	• categorizes different points of view regarding the issue; *e.g., cultural, ethical, economic, environmental, health-related, scientific, political*
• states a position on the issue and logical reasons for adopting that position	• states a position on the issue and logical reasons for adopting that position	• states a position on the issue and insightful reasons for adopting that position
• states an opposing position on the issue and logical reasons for adopting that position	• states two or more opposing positions on the issue and logical reasons for adopting each position	• states three or more opposing positions on the issue and thoughtful reasons for adopting each position
• identifies sources of conflict among different positions	• describes interrelationships among different perspectives/points of view	• analyzes interrelationships among different perspectives/points of view
• distinguishes between fact and fiction/opinion/theory	• determines accuracy/currency/reliability of information and ideas	• recognizes underlying bias/assumptions/values in information and ideas
Collaboration and Teamwork	**Collaboration and Teamwork**	**Collaboration and Teamwork**
• shares work appropriately among group members	• shares work appropriately among group members	• shares work appropriately among group members
• respects the views of others	• respects and considers the views of others	• respects and considers the views of others
	• negotiates solutions to problems	• negotiates with sensitivity solutions to problems
Evaluating Choices/Making Decisions	**Evaluating Choices/Making Decisions**	**Evaluating Choices/Making Decisions**
• identifies useful alternatives regarding the issue	• identifies important and appropriate alternatives regarding the issue	• describes in detail important and appropriate alternatives regarding the issue
• establishes criteria for assessing each alternative; *e.g., social, economic, environmental*	• establishes knowledge- and value-based criteria for assessing each alternative; *e.g., social, economic, environmental*	• establishes knowledge- and value-based criteria for assessing each alternative; *e.g., social, economic, environmental*
• selects an appropriate alternative based on established criteria	• selects an appropriate alternative by showing differences among choices	• selects an appropriate and useful alternative by showing differences among choices
• reflects on strengths/weaknesses of decisions by considering consequences	• assesses strengths/weaknesses of decisions by considering consequences	• assesses strengths/weaknesses of decisions by considering consequences and implications
• communicates information in a logical sequence to justify choices/decisions made	• communicates ideas in a logical sequence with supporting detail to justify choices/decisions made	• communicates thoughts/feelings/ideas clearly to justify choices/decisions made

INTRODUCTORY	INTERMEDIATE	ADVANCED
The student:	*The student:*	*The student:*
Management • prcparcs self for task • organizes and works in an orderly manner • carries out instructions accurately • uscs time effectively	**Management** • prepares self for task • organizes and works in an orderly manncr • intcrprets and carries out instructions accuratcly • plans and uses time effectively • adheres to routine procedurcs	**Management** • prepares self for task • organizes and works in an orderly manner • interprets and carries out instructions accurately • plans and uses time effectively in a logical sequence • displays leadcrship in adhering to routine proccdures • attempts to solve problems prior to rcquesting help
Teamwork • cooperates with group membcrs • shares work appropriatcly among group members	**Teamwork** • coopcrates with group members • shares work appropriatcly among group membcrs • negotiates solutions to problems	**Teamwork** • cooperates with group members • shares work appropriately among group mcmbers • negotiates with sensitivity solutions to problems • displays effective communication skills
Use of Equipment and Materials • sclccts and uses appropriate equipmcnt/matcrials • follows safe proccdures/techniques • weighs and measures accurately • returns clean equipment/materials to storagc areas	**Use of Equipment and Materials** • selects and uses appropriate equipment/matcrials • models safe procedures/techniques • weighs and measurcs accurately • practises proper sanitation procedures • minimizcs waste of materials • advises of potential hazards and nccessary repairs	**Use of Equipment and Materials** • selccts and uses equipment/materials independcntly • dcmonstratcs concern for safe procedures/techniques • weighs and measures accurately and efficiently • practiscs proper sanitation procedures • minimizes waste of materials • anticipates potential hazards and emergency response
Investigative Techniques • gathcrs and applies information from at least one source • makes predictions that can be tested • sets up and conducts experiments to test a prediction • distinguishcs bctween manipulated/responding variables • obtains results that can be used to determine if some aspect of the prediction is accuratc • summarizes important experimental outcomes	**Investigative Techniques** • gathers and applics information from a variety of sources • makes predictions that can be tested • plans, sets up and conducts experiments to test a prediction • identifics and explains manipulated/responding variables • obtains accurate results that confirm/reject the prediction • summarizes and applies experimcntal outcomes	**Investigative Techniques** • uses relevant information to explain observations • makcs predictions that can be tested • plans, sets up and conducts experiments to test a prediction • analyzes relationships among manipulated/responding variables • obtains accurate results that confirm/reject prediction and answer related questions • summarizes, applies and evaluates experimcntal outcomes

INTRODUCTORY	INTERMEDIATE	ADVANCED
The student:	*The student:*	*The student:*
Preparation and Planning	**Preparation and Planning**	**Preparation and Planning**
• accurately describes an issue on which people disagree	• accurately describes an issue on which people disagree, explaining areas of disagreement	• accurately describes an issue on which people disagree, explaining specific causes of disagreement
• poses an important question regarding the issue	• poses one or more thoughtful questions regarding the issue	• poses thoughtful questions regarding the issue
• accesses basic in-school/community information sources regarding the issue	• accesses a range of relevant in-school/community resources	• accesses a range of relevant information sources and recognizes when additional information is required
• uses one or more information-gathering techniques	• uses a range of information-gathering techniques	• demonstrates resourcefulness in collecting data
Analyzing Perspectives	**Analyzing Perspectives**	**Analyzing Perspectives**
• states a position on the issue and logical reasons for adopting that position	• states a position on the issue and logical reasons for adopting that position	• states a position on the issue and insightful reasons for adopting that position
• explains why the issue is important by presenting examples of possible consequences	• explains why the issue is important by presenting examples of possible consequences	• explains why the issue is important by presenting examples of possible consequences and implications
• clarifies different points of view regarding the issue; *e.g., social, economic, environmental*	• categorizes different points of view regarding the issue; *e.g., cultural, ethical, economic, environmental, health-related*	• categorizes different points of view regarding the issue; *e.g., cultural, ethical, economic, environmental, health-related, scientific, political*
• distinguishes between fact and fiction/opinion/theory	• determines accuracy/currency/reliability of information and ideas	• recognizes underlying bias/assumptions/values in information and ideas
Collaboration and Teamwork	**Collaboration and Teamwork**	**Collaboration and Teamwork**
• works with a range of peer members	• works with a range of peer members	• works with a wide range of peer members
• shares information/opinions/suggestions through group discussion	• shares information/opinions/suggestions, maintaining a balance between speaking and listening	• shares information/opinions/suggestions, maintaining a balance between speaking and listening
• listens to and respects the views of others	• listens to and respects the views of others, requesting clarification as necessary from other group members	• listens to and respects the views of others, requesting clarification as necessary from other group members
Negotiating and Debating	**Negotiating and Debating**	**Negotiating and Debating**
• presents a convincing argument in logical sequence supporting a position adopted on the issue	• presents a convincing argument in logical sequence supporting a position adopted, conveying points in order of importance	• presents a convincing argument in logical sequence supporting a position adopted, conveying points in order of importance and backing each with sound evidence
• provides a relevant response to opposing arguments	• provides a relevant and convincing response to opposing arguments	• provides a relevant and convincing rebuttal to opposing arguments
• speaks clearly so the argument can be understood	• speaks clearly without hesitation so the argument can be understood	• speaks clearly without hesitation so the argument can be understood by all listeners
• establishes a shared understanding of key alternatives and consequences relevant to the issue	• negotiates a shared agreement on preferred alternatives relevant to the issue	• negotiates a shared agreement on preferred alternatives by resolving divergent points of view

INTRODUCTORY	INTERMEDIATE	ADVANCED
The student:	*The student:*	*The student:*
Preparation and Planning • sets goals and follows instructions accurately • responds to directed questions and follows necessary steps to find answers • accesses basic in-school/community information sources • interprets and organizes information into a logical sequence • records information accurately, using correct technical terms • uses time effectively	**Preparation and Planning** • sets goals and describes steps to achieve them • uses personal initiative to formulate questions and find answers • accesses a range of relevant in-school/community resources • interprets, organizes and combines information into a logical sequence • records information accurately with appropriate supporting detail and using correct technical terms • plans and uses time effectively • gathers and responds to feedback regarding approach to task and project status	**Preparation and Planning** • sets goals and describes steps to achieve them • uses personal initiative to formulate questions and find answers • accesses a range of relevant information sources and recognizes when additional information is required • interprets, organizes and combines information in creative and thoughtful ways • records information accurately, using appropriate technical terms and supporting detail • plans and uses time effectively, prioritizing tasks on a consistent basis • assesses and refines approach to task and project status based on feedback and reflection
Presentation • demonstrates effective use of at least one medium of communication: *e.g.,* <u>*Written:*</u> *spelling, punctuation, grammar, basic format* <u>*Oral:*</u> *voice projection, body language* <u>*Audio-Visual:*</u> *techniques, tools* • uses correct grammatical convention and technical terms through proofreading/editing • provides an introduction that describes the purpose of the project • communicates information in a logical sequence • states a conclusion based on a summary of facts • provides a reference list of three or more basic information sources	**Presentation** • demonstrates effective use of at least two communication media: *e.g.,* <u>*Written:*</u> *spelling, punctuation, grammar, format (formal/informal)* <u>*Oral:*</u> *voice projection, body language, appearance* <u>*Audio-Visual:*</u> *techniques, tools, clarity* • maintains acceptable grammatical and technical standards through proofreading and editing • provides an introduction that describes the purpose and scope of the project • communicates ideas into a logical sequence with sufficient supporting detail • states a conclusion by synthesizing the information gathered • provides a reference list that includes five or more relevant information sources	**Presentation** • demonstrates effective use of a variety of communication media: *e.g.,* <u>*Written:*</u> *spelling, punctuation, grammar, format (formal/informal, technical/literary)* <u>*Oral:*</u> *voice projection, body language, appearance, enthusiasm, evidence of prior practice* <u>*Audio-Visual:*</u> *techniques, tools, clarity, speed and pacing* • maintains acceptable grammatical and technical standards through proofreading and editing • provides an introduction that describes the purpose and scope of the project • communicates thoughts/feelings/ideas clearly to justify or challenge a position • states a conclusion by analyzing and synthesizing the information gathered • gives evidence of adequate research through a reference list including seven or more relevant information sources

INTRODUCTORY	INTERMEDIATE	ADVANCED
The student:	*The student:*	*The student:*
Preparation and Planning • sets goals and follows instructions accurately • adheres to established timelines • responds to directed questions and follows necessary steps to find answers • uses time effectively	**Preparation and Planning** • sets goals and establishes steps to achieve them • creates and adheres to useful timelines • uses personal initiative to formulate questions and find answers • plans and uses time effectively	**Preparation and Planning** • sets clear goals and establishes steps to achieve them • creates and adheres to detailed timelines • uses personal initiative to formulate questions and find answers • plans and uses time effectively, prioritizing tasks on a consistent basis
Information Gathering and Processing • accesses basic in-school/community information sources • uses one or more information-gathering techniques • interprets and organizes information in a logical sequence • records information accurately, using correct technical terms • distinguishes between fact and fiction/opinion/theory • responds to feedback when current approach is not working	**Information Gathering and Processing** • accesses a range of relevant in-school/community resources • uses a range of information-gathering techniques • interprets, organizes and combines information into a logical sequence • records information accurately with appropriate supporting detail and using correct technical terms • determines accuracy/currency/reliability of information sources • gathers and responds to feedback regarding approach to the task	**Information Gathering and Processing** • accesses a range of relevant information sources and recognizes when additional information is required • demonstrates resourcefulness in collecting data • interprets, organizes and combines information in creative and thoughtful ways • records information accurately with appropriate supporting detail and using correct technical terms • recognizes underlying bias/assumptions/values in information sources • assesses and refines approach to the task and project status based on feedback and reflection
Collaboration and Teamwork • cooperates with group members • shares work appropriately among group members	**Collaboration and Teamwork** • cooperates with group members • shares work appropriately among group members • negotiates solutions to problems	**Collaboration and Teamwork** • cooperates with group members • shares work appropriately among group members • negotiates with sensitivity solutions to problems • displays effective communication and leadership skills
Information Sharing • demonstrates effective use of one or more communication media; *e.g., written, oral, audio-visual* • communicates information in a logical sequence • uses correct grammatical convention and technical terms • cites three or more basic information sources	**Information Sharing** • demonstrates effective use of two or more communication media; *e.g., written, oral, audio-visual* • communicates ideas in a logical sequence with sufficient supporting detail • maintains acceptable grammatical and technical standards • cites five or more relevant information sources	**Information Sharing** • demonstrates effective use of a variety of communication media; *e.g., written, oral, audio-visual* • communicates thoughts/feelings/ideas clearly to justify or challenge a position • maintains acceptable grammatical and technical standards • gives evidence of adequate information gathering by citing seven or more relevant information sources

ASSESSMENT CHECKLIST: Basic Competencies	MECBC–1

STANDARD	Indicate student basic competency stage for each competency listed in module conditions and criteria. For detailed description of developmental stages refer to basic competency reference guide.

BASIC COMPETENCY	STAGES				
	1	2	3	4	N/R
Managing Learning					
Managing Resources					
Problem Solving & Innovation					
Communicating Effectively					
Working with Others					
Demonstrating Responsibility					

REFLECTIONS/COMMENTS:

ASSESSMENT GUIDE: Career Profile	MECCP–1

STANDARD	Students working at STANDARD must complete all sections of the career profile and demonstrate standard provided in column at the right. Use Presentations/Reports reference guide for rating scale.

Area of Career Exploration:

Criteria	Minimum Standard Introductory	Minimum Standard Intermediate	Minimum Standard Advanced	Observation
Job Title:	1	2	3	_____
Task Description:	1	2	3	_____
Working Conditions:	1	2	3	_____
Educational Qualifications	1	2	3	_____
Employment Opportunities	1	2	3	_____
Potential for Advancement	1	2	3	_____
Salary Range Benefits	1	2	3	_____
How would you enjoy the work? Aspects you would not enjoy?	1	2	3	_____
References used.	1	2	3	_____

REFLECTIONS/COMMENTS:

ASSESSMENT GUIDE: Customer Service — MECCS–1

STANDARD	Students working at STANDARD must demonstrate the level of competency as indicated in module conditions and criteria and the standard indicated in rating columns below. The space to the right is provided for the recording of student performance.

Rating Scale

4. Completed tasks in self directed manner, selecting and implementing the most appropriate course of action. Problems were solved in effective and creative ways. Quality and productivity exceed standards.
3. Completed tasks in a self-directed manner, selecting and using resources efficiently and effectively. No errors or deficiencies are noted. Quality and productivity consistently meet standards.
2. Completed tasks with limited assistance in planning, solving problems and in selection and use of resources. Only minor errors or deficiencies are noted. Quality and productivity meet standards, but are occasionally inconsistent.
1. Completed tasks as directed, demonstrating basic skills by following a guided course of action. Quality and productivity meet standard by are inconsistent.
0. Not yet completed tasks, major deficiencies and/or errors are evident.

CRITERIA	PROBLEM			
	Minimum Standard Introductory	Minimum Standard Intermediate	Minimum Standard Advanced	Observation
The student:				
Customer Need				
☐ greets customer in appropriate manner	2	2	3	_____
☐ is friendly/helpful while receiving order	2	2	3	_____
☐ asks leading questions to prompt customer response.	2	2	3	_____
Writing Work Order				
☐ provides proper opening and closing	2	2	3	_____
☐ enters required details	2	2	3	_____
☐ uses appropriate service data (serial #, etc.)	2	2	3	_____
☐ is legible	2	2	3	_____
Performs Service				
☐ responds to customer need	2	2	3	_____
☐ sees other potential problems	2	2	3	_____
☐ manages time	2	2	3	_____
☐ shows eagerness, enthusiasm for working on	2	2	3	_____
☐ demonstrate ethics	2	2	3	_____
Work Collaboratively				_____
☐ is able to get along with co-workers	2	2	3	_____
☐ takes responsibility for balanced work load	2	2	3	_____
☐ contributes to problem solving and decision making	2	2	3	_____
Quality of Service				_____
☐ service meets work order request	2	2	3	_____
☐ service exhibits completeness in adjustments,	2	2	3	_____
☐ uses supplies effectively, tools used correctly	2	2	3	_____
☐ cleanliness/general appearance restored	2	2	3	_____
☐ report portrays service performed	2	2	3	_____
Maintenance Schedule				_____
☐ includes unit descriptive information	2	2	3	_____
☐ includes service variables - function, frequency of	2	2	3	_____
☐ shows comprehensive schedule				
REFLECTIONS/COMMENTS:				

TASK						
Identifying the Problem	4	3	2	1	0	N/A
Correction of the Problem	4	3	2	1	0	N/A
Evaluation of the Problem	4	3	2	1	0	N/A

Rating Scale

4	Problems were solved in effective and creative ways in a self-directed manner. Follows appropriate steps to determine the extent of the problem and is able to recommend a number of possible solutions. Chooses and evaluates the best possible solution.
3	Understands the problem. Follows appropriate steps to determine the extend of the problem and is able to recommend a number of solutions.
2	Understands the problem and with limited guidance is able to determine the extent of the problem and able to recommend two solutions.
1	Has some understanding of the problem. With assistance can recommend one solution to the problem.
0	Does not understand the problem. No solution found.

Performance Rating:
See Module Conditions and Criteria

PROBLEM SOLVING CHECKLIST:

Problem: (See module conditions and criteria)

_____

_____

_____

_____

The student:

Identifying the Problem:
- ☐ uses proper tools, equipment and resources
- ☐ pin points faulty system(s) and/or sub system(s)
- ☐ pin points faulty component(s)
- ☐ uses acceptable procedure
- ☐ documents the problem

Correction/Solution
- ☐ uses acceptable process
- ☐ uses proper tools and/or equipment
- ☐ restores to acceptable standard
- ☐ uses most cost effective approach

Evaluation of Problem
- ☐ is able to verify corrected problem
- ☐ is able to recommend ways to avoid/minimize problem in future

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Laboratory Practices — MEC101–1

STANDARD: Students working at STANDARD must demonstrate a level 2 for safety and level 1 for the remainder of the criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
	The student:		
Part 1	**Safety** ☐ follows established shop/lab procedures ☐ selects and uses tools safely ☐ maintains a safe and tidy work place	2	_____
Part 2	**Modes of Transportation** ☐ lists modes of transportation ☐ describes systems common to all modes of transportation	1	_____
Part 3	**Researches, Designs and Builds** ☐ selects and uses resources to research project ☐ designs a concept vehicle ☐ builds a concept vehicle ☐ tests and evaluates concept vehicle	1	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Vehicle Service and Care — MEC102–1

STANDARD: Students working at STANDARD must demonstrate a level 2 for safety and level 1 for the remainder of the criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services..
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab procedures ☐ properly handles fluids ☐ safely handles chemicals	2	_____
Part 2	**Service Schedule** ☐ selects and uses resources ☐ develops a service schedule ☐ includes make, model and year of vehicle ☐ includes vehicle factors such as distance, time and operating conditions ☐ list checks pertaining to fluids, filters, tires, battery, belts/chains, lights and body	1	_____
Part 3	**Inspections** ☐ inspects, adjusts or replaces items as specified on developed service schedule	1	_____
Part 4	**Exterior/Interior Surfaces** ☐ selects and uses products to enhance exterior surfaces ☐ selects and uses products to enhance interior surfaces ☐ selects and uses equipment	1	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Engine Fundamentals	MEC104–1

STANDARD: Students working at STANDARD must demonstrate a level 2 for safety and level 1 for the remainder of the criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab procedures ☐ selects and uses tools and equipment ☐ understands the hazards of gasoline ☐ handles gasoline in accepted manner	2	_____
Part 2	**Engine Operating Principles** ☐ selects and uses resources ☐ explains the two stroke cycle principle ☐ explains the four stroke cycle principle	1	_____
Part 3	**Engine Condition** ☐ given an engine determine the mechanical condition including compression pressures ☐ determines spark voltages and timing ☐ determines fuel supply to the cylinder ☐ measures engine bore and stroke ☐ determines the engine displacement	1	_____
Part 4	**Combustion By-Products** ☐ lists combustion by-products ☐ states the impact on the environment	1	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Electrical Fundamentals — MEC109–1

STANDARD: Students working at STANDARD must demonstrate a level 2 for safety and level 1 for the remainder of the criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab procedures ☐ uses personal protective equipment ☐ selects and uses electrical meters ☐ observes recommended procedures when handling/servicing batteries	2	_____
Part 2	**Electrical Principles** ☐ recognizes series and parallel circuits on vehicles ☐ recognizes open, closed, shorted and grounded condition ☐ selects and uses volt meter ☐ selects and uses ammeter ☐ selects and uses ohmmeter ☐ uses meters to check lighting, charging and starting system ☐ tests battery state of charge and condition	1	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Pneumatic and Hydraulic System — MEC111–1

STANDARD: Students working at STANDARD must demonstrate a level 2 in safety and other as specified in module conditions and criteria. Use the rating scale below to assess student performance

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

	CRITERIA	Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab procedures ☐ understands and follows practices when working with pressurized pneumatic and hydraulic systems. ☐ understands and follows clean-up procedures for hydraulic fluids	2	_____
Part 2	**Operating Principles** ☐ states operating principles for pneumatics ☐ states operating principles for hydraulics ☐ lists units involved in pneumatic and hydraulic systems ☐ states where systems are used on vehicles	1	_____
Part 3	**Operating Systems** ☐ recognizes and operates pneumatic system ☐ recognizes and operates hydraulic system	1	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Mechanical Systems	MEC113–1

STANDARD: Students working at STANDARD must demonstrate a level 2 for safety and level 1 for the remainder of the criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

	CRITERIA	Standard	Observation
	The student:		
Part 1	**Safety** ☐ follows established shop/lab routines ☐ selects and uses tools and equipment safely	2	_____
Part 2	**Mechanical Principles** ☐ describes simple machines and their purpose ☐ lists types of mechanical motion ☐ states how mechanical energy is converted into other energy forms ☐ provides examples of mechanical principles on vehicles	1	_____
Part 3	**Mechanical Systems** ☐ given a mechanical system determine torque and gear ratio ☐ states mechanical advantage from input to output ☐ understands friction and can determine coefficient of friction on a given application	1	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Ride and Control Systems	MEC115–1

STANDARD: Students working at STANDARD must demonstrate a level 2 for safety and level 1 for the remainder of the criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

	CRITERIA	Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab routines ☐ selects and uses floor jacks and safety stands	2	_____
Part 2	**Ride and Control Principles** ☐ reports on operation and purpose of suspension, steering and braking systems as applied to land vehicle and aircraft ☐ reports on how hydraulics, pneumatics, electrical are applied to ride and control systems	1	_____
Part 3	**Inspection and Service** ☐ identifies suspension, steering and brake system components ☐ lists points of service/wear on ride and control system ☐ locates components on a vehicle ☐ inspects and repacks wheel bearing ☐ identifies tire wear patterns	1	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Vehicle Structures and Materials MEC116–1

STANDARD: Students working at STANDARD must demonstrate a level 2 for safety and level 1 for the remainder of the criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab routines ☐ recognizes health hazards associated with coated surfaces ☐ demonstrates how hazardous materials are handled and disposed of	2	_____
Part 2	**Vehicle Structures** ☐ reports how the function of a vehicle dictates the materials used in construction for interior and exterior surfaces ☐ lists materials used in vehicle construction ☐ lists types of fasteners ☐ lists types of structural coatings utilized	1	_____
Part 3	**Identification** ☐ identifies structural parts on a vehicle ☐ identifies materials in parts ☐ identifies fasteners and coatings	1	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Metal Forming and Finishing **MEC117–1**

STANDARD: Students working at STANDARD must demonstrate a level 2 for safety and level 1 for the remainder of the criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. .Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab routines ☐ uses personal protection equipment ☐ selects and uses tools and equipment associated with metal forming and finishing	2	_____
Part 2	**Distortion and Corrosion** ☐ states effects of distortion and corrosion on ferrous sheet metal ☐ states characteristics of sheet metal including work hardening	1	_____
Part 3	**Repair** ☐ repairs a minor dent in a panel ☐ repairs a rust out in a panel	1	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Surface Preparation — MEC119–1

STANDARD: Students working at STANDARD must demonstrate a level 2 for safety and level 1 for the remainder of the criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab procedures related to abrasive dust and chemical fumes ☐ selects and uses tools and equipment associated with surface preparation ☐ uses WHMIS Material Safety Data Sheets (MSDS)	2	_____
Part 2	**Products, Equipment and Procedures** ☐ lists surface conditions ☐ describes repair procedures for each condition ☐ lists abrasives and alternatives for surface preparation ☐ describes how abrasives are used ☐ lists and describes tools and equipment required	1	_____
Part 3	**Surface Preparations on a Given Surface** ☐ analyzes surface preparation process ☐ performs surface preparation	1	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Vehicle Detailing	MEC201–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows lab/shop procedures ☐ observes environmental concerns when using chemicals ☐ recognizes and observes hazards associated with cleaning and waxing agents	2	_____
Part 2	**Identification of Material and Products** ☐ lists and describes materials and products used for detailing vehicles ☐ lists and describes possible trim additions	2	_____
Part 3	**Exterior Surface Including Engine Compartment** ☐ selects and uses cleaning and treatment products on paint, glass, vinyl and rubber	2	_____
Part 4	**Trim and Accessory Parts** ☐ selects and uses resources ☐ identifies parts/components ☐ selects and uses tools for trim/accessory installation ☐ installs trim/accessories	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Vehicle Maintenance — MEC202–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab procedures ☐ properly handles fluids ☐ safely handles chemicals ☐ selects and understands WHMIS data sheets	2	_____
Part 2	**Service Schedule** ☐ develops a service schedule using resources ☐ includes make, model, year and serial number ☐ includes vehicle factors such as distance, time and operating condition ☐ includes items to be checked, serviced or replaced ☐ includes all systems, sub-systems and components	2	_____
Part 3	**Inspection** ☐ selects and uses resources ☐ inspects all items as dictated by service schedule	2	_____
Part 4	**Service and Repair** ☐ services and repairs vehicle according to service schedule	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Lubrication and Cooling Systems	MEC203–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows lab/shop procedures ☐ selects and uses tools and equipment ☐ selects, uses and disposes of vehicle fluids according to accepted practices	2	_____
Part 2	**Fluid Conditions** ☐ lists components and describes engine lubrication and cooling systems function and operation ☐ lists properties of coolant and oils	2	_____
Part 3	**Service a Vehicle** ☐ diagnoses cooling and lubrication system problems ☐ service/repair cooling system ☐ services/repairs lubrication system	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Fuel and Exhaust Systems	MEC204–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows lab/shop procedures ☐ selects and uses tools and equipment ☐ understands fire extinguishers and how to use them	2	_____
Part 2	**Combustion of Fuels** ☐ understands the importance of, and need for, varying air fuel ratios in combustion processes ☐ understands the importance of air flow, atomization, and pre and post ignition ☐ understands the importance of exhaust systems and back pressure	2	_____
Part 3	**Diagnoses and Repair** ☐ selects and uses resources ☐ diagnoses fuel system ☐ diagnoses exhaust system ☐ services/repairs fuel and exhaust system	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Alternate Fuel Engines — MEC205–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows lab/shop procedures ☐ follows prescribed precautions when starting, stopping, parking, storing and refuelling alternate fuel vehicles ☐ understands storage of alternate fuels	2	_____
Part 2	**Alternate Fuels** ☐ identifies alternate fuels ☐ indicates factors that dictate the use of alternate fuels ☐ explains the components required and modification necessary (when compared to gasoline engines) to accommodate alternate fuels	2	_____
Part 3	**Service** ☐ determines the specific service requirement of each fuel ☐ completes a service schedule for a given vehicle ☐ services an alternate fuelled vehicle	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Ignition Systems	MEC206–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ observes shop/lab procedures ☐ explains dangers of high voltage and high currents	2	_____
Part 2	**Ignition Spark** ☐ explains how timed high voltage spark is produced in magneto, point and electronic ignition systems	2	_____
Part 3	**Ignition Problems** ☐ diagnoses ignition problems in magnets, paint and electrical systems	2	_____
Part 4	**Service Ignition System** ☐ services magneto/point ignition system ☐ services electronic ignition system	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Emission Controls	MEC207–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

	CRITERIA	Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures ☐ selects and uses tools and equipment appropriately ☐ selects and uses personal protective equipment appropriately ☐ explains health hazards of vehicle emissions	2	_____
Part 2	**Pollutants** ☐ identifies and lists vehicle pre and post combustion emissions ☐ identifies the effects of vehicle pollutants on the environment ☐ describes regulations pertaining to emission standards ☐ compares emissions from gasoline engines to alternate fuel engines	2	_____
Part 3	**Emission Control Systems** ☐ identifies and lists types of emission control systems	2	_____
Part 4	**Components on a Given Vehicle** ☐ identifies/locates emission control components ☐ explains how components work to reduce emissions ☐ checks if all components exists for respective systems	2	_____
Part 5	**Diagnose and Service on a Given Vehicle** ☐ uses a gas analyzer to check vehicle emission ☐ compares data to specifications and diagnosing faults ☐ services emission control system	2	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Electricál Components	MEC209–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures when working with electrical circuits ☐ explains how to avoid sparks, grounds and electrical shorts ☐ understands to need to observe proper polarity	2	_____
Part 2	**Electrical Systems** ☐ describes lighting, charging and starting electrical systems ☐ lists components in each electrical system ☐ describes the operation of each electrical system	2	_____
Part 3	**Testing Systems** ☐ selects and uses voltmeter, ammeter and ohmmeter ☐ tests for open and closed circuits ☐ tests for load voltage and voltage drops ☐ tests for current draw ☐ tests for resistances ☐ recognizes abnormal electrical circuit conditions including grounds and shorts	2	_____
Part 4	**Testing and Service** ☐ disassembles, tests and reassembles starter motor ☐ disassembles, tests and reassembles alternator ☐ tests assembled starter/alternator on or off of vehicle	2	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Power Assist Accessories	MEC210–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

	CRITERIA	Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures ☐ selects and uses tools and equipment ☐ observes personal and vehicle care	2	_____
Part 2	**Power Assist Accessories** ☐ lists available power assist accessories on vehicles ☐ states how power assist accessories function to perform or assist mechanical tasks ☐ lists the components that make-up power assist systems	2	_____
Part 3	**Components** ☐ describes function and operation of power assist components ☐ determines on a given system(s), level of performance	2	_____
Part 4	**Service and Repair** ☐ selects and uses tools to identify problem ☐ services/repairs a system ☐ evaluates repair and possible factors creating problems	2	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Braking Systems — MEC211–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
	The student:		
Part 1	**Safety** ☐ follows established shop/lab procedures ☐ selects and uses personal protective equipment ☐ understands the safe practices when working with asbestos ☐ understands the safety implications when working with brakes	2	_____
Part 2	**Brake Design** ☐ identifies and describes brake systems and components ☐ explains operation and function of service and emergency brake systems	2	_____
Part 3	**Analyze Brake Systems** ☐ lists factors/symptoms of worn or defective brake system components ☐ selects and uses tools and equipment to check for defective brake system ☐ inspects and identifies brake system components requiring service	2	_____
Part 4	**Service and Repair** ☐ selects and uses tools and equipment ☐ services drum and disc brake systems ☐ services emergency brake systems	2	_____
Part 5	**Resources** ☐ selects and uses brake resources ☐ transfers specifications/information to service brake systems	2	_____
REFLECTIONS/COMMENTS:			

Module Learner Expectations

The student: Inspects and services brake systems.

NOTE: Student should have the opportunity to complete one disc, drum brake and emergency brake assembly.

SAMPLE ITEM(S)

BRAKE SYSTEM INSPECTION

Factors/Symptoms of Worn or Defective Brake System

- Inspects brake system components to determine serviceability:
  - brake pedal action ,checking pedal height, pedal reserve and free play
  - brake fluid condition, level and leaks
  - drum brake:
    - lining - condition, thickness
    - hardware - springs, clips, pins, self adjusters
    - wheel cylinder - leakage, boot condition, bleeder screw
    - drum - size, condition, scoring, bellmouthing
  - disc brake:
    - brake pad lining - thickness, condition
    - calliper - condition, leaks, sticking
    - hardware - retaining/guide pins, clips, sleeves/bushings
    - disc - condition, thickness, parallelism, run out, scoring
  - park brake:
    - pedal/lever operation
    - cable/housing - condition, freeness
    - hardware - adjusters, equalizer strut, lever condition
  - lines:
    - condition, leaks, clips in place
  - hoses:
    - condition, cracks, leaks, clips in place
  - master cylinder:
    - condition, fluid leaks, pedal feel, pedal build-up, pedal falling away (checks indicate condition of cups, free compensating port)
  - control valves:
    - condition of metering and proportioning valve
  - other:
    - warning lights, brake lights, and other conditions affecting brakes, i.e., tires, wheel bearings, suspension, steering
- Symptoms before road test:
  - brake warning light on
  - low brake fluid level
  - brake fluid leaks
  - incorrect brake pedal feel - spongy, little or no reserve, noises

Factors/Symptoms of Worn or Defective Brake System (cont'd)

- Factors/Symptoms during road test::
  - brakes pull to one side
  - noisy brakes - squeal, scraping, clunk
  - brakes locking or grabbing
  - little or no stopping ability
  - pulsating pedal
  - vehicle vibrates
- Factors/Symptoms when vehicle on the hoist:
  - brake fluid visible on backing plates, line/hoses, connections, master cylinder
  - excessive brake drag
  - loose wheel bearings, suspension steering components
  - defective master cylinder, wheel cylinder, calliper
  - worn/defective brake drum or rotor
  - uneven tire condition, and or pressures
  - worn or defective brake linings or pads

TASK ASSESSMENT CHECKLIST: Hydraulic Accessories	MEC212–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows established shop/lab procedures ☐ selects and uses tools, equipment and resources ☐ selects and uses personal protective equipment ☐ understands hazards associated with pressurized hydraulics	2	_____
Part 2	**Hydraulic Principles** ☐ selects and uses hydraulic resources ☐ lists and explains function of hydraulic systems and components	2	_____
Part 3	**Service Techniques** ☐ selects and uses hydraulic service resources ☐ lists procedures and techniques in servicing hydraulic system/components ☐ develops a service schedule	2	_____
Part 4	**Service** ☐ services a designated system ☐ services/repairs components	2	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Power Trains — MEC213–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

	CRITERIA	Standard	Observation
	The student:		
Part 1	**Safety** ☐ follows shop/lab procedures ☐ selects and uses tools, equipment and materials ☐ recognizes back problems associated with lifting heavy objects	2	_____
Part 2	**Function of Power Train** ☐ lists power train components and states function ☐ states the inter-relationship of power train components ☐ develops a service schedule for power train components	2	_____
Part 3	**Inspection and Service** ☐ inspects and diagnoses power train components ☐ services power train components ☐ removes and replaces power train components	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Manual Transmission and Transaxles MEC214–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
	The student:		
Part 1	**Safety** ☐ follows shop/lab procedures ☐ selects and uses tools, equipment and supplies ☐ selects and uses vehicle protection equipment ☐ follows lifting practices to avoid back injuries	2	_____
Part 2	**Power Path** ☐ identifies power train components of a vehicle equipped with manual transmission/transaxle ☐ explains flow of power in various gear selector positions ☐ lists problem areas in clutches and transmissions	2	_____
Part 3	**Inspection and Service** ☐ inspects and reports on a manual power train ☐ diagnoses and lists possible problems in power train ☐ services power train ☐ removes, inspects and replaces clutch assembly ☐ disassembles, inspects and reassembles manual transmission	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Suspension Systems	MEC215–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

	CRITERIA	Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures ☐ selects and uses tools, equipment and materials ☐ selects and uses personal protective equipment	2	_____
Part 2	**Identification of Components** ☐ identifies and lists suspension components ☐ identifies parts/components subject to wear ☐ identifies tolerances/indicators of defective components	2	_____
Part 3	**Identification of Defective Components** ☐ identifies worn or defective suspension components ☐ analyzes reasons for worn or defective components ☐ identifies driveability problems associated with worn or defective components	2	_____
Part 4	**Service and Repair** ☐ selects and uses service resources ☐ selects and uses tools, equipment and materials ☐ removes and replaces suspension components	2	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Steering Systems — MEC216–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures ☐ selects and uses tools, equipment and materials ☐ understands the safety implications when working on steering systems	2	_____
Part 2	**Steering Design** ☐ identifies common steering system designs and their application ☐ lists advantages and disadvantages of individual designs ☐ identifies components of common steering system and their function ☐ identifies the evolution of steering systems	2	_____
Part 3	**Service and Repair** ☐ identifies worn or defective components ☐ explains procedures for service/repair of components ☐ removes and replaces steering components	2	_____
Part 4	**Driving Symptoms** ☐ lists driving symptoms of worn or defective steering components ☐ indicates factors that cause premature steering failure	2	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Metal Repair and Finishing — MEC217–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

	CRITERIA	Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures ☐ selects and uses welding and sheet metal straightening system equipment	2	_____
Part 2	**Major Sheet Metal Damage** ☐ describes direct and indirect collision damage ☐ describes buckles ☐ describes forces that create damage	2	_____
Part 3	**Major Sheet Metal Repair on a Given Project** ☐ analyzes and determines sequence of repair ☐ performs metal straightening ☐ performs metal working ☐ performs a large rust out repair	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Trim Removal and Installation — MEC218–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
	The student:		
Part 1	**Safety** ☐ follows shop/lab procedures with respect to use of tools and chemicals in trim work	2	_____
Part 2	**Trim Systems** ☐ describes interior/exterior trim materials ☐ describes window/door lock hardware function and part arrangement ☐ lists and describes fasteners used on interior and exterior trim	2	_____
Part 3	**Removal and Replacement of Trim** ☐ selects and uses trim tools ☐ removes and installs interior door trim ☐ removes and installs exterior trim	2	_____
Part 4	**Enhancement Trim** ☐ analyzes vehicle and proposes enhancement trim	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Surface Preparation II	MEC219–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures ☐ selects and uses tools, equipment and materials ☐ understands hazards involved in surface preparation through sand blasting, chemical treatment and abrasives ☐ uses personal protective equipment	2	_____
Part 2	**Materials and Practices** ☐ lists metals and appropriate treatment ☐ lists plastics and preparation techniques ☐ lists and describes chemical use in surface preparation ☐ lists and identifies abrasive use in surface preparation ☐ lists chemical treatments and describes application	2	_____
Part 3	**Advanced Preparation on a Given Surface** ☐ analyzes and determines preparation process ☐ selects and uses chemical application ☐ selects and applies coatings ☐ selects and compounds a surface	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Refinishing I	MEC220–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures ☐ identifies health hazards involved in refinishing ☐ uses personal protective equipment ☐ understands related WHMIS MSDS sheets	2	_____
Part 2	**Products and Equipment** ☐ identifies and describes spray systems ☐ explains spray techniques ☐ lists spray problems and causes ☐ lists and describes top coat applications	2	_____
Part 3	**Refinish Application** ☐ selects and uses paints (including reducers/hardener) for a given application ☐ demonstrates spray procedures/techniques ☐ demonstrates clean-up/care of spray equipment ☐ identifies spray problems and corrects	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Basic Touch-up and Finishing — MEC221–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures ☐ selects and uses tools, equipment and materials ☐ identifies health hazards related to touch-up and finishing including disposal of products ☐ observes health hazards associated with primers and putties	2	_____
Part 2	**Techniques and Products** ☐ lists and describes products used in spot repair ☐ lists and describes techniques used in spot repair ☐ lists tools and equipment required for spot repair ☐ analyzes a given repair and outlines repair procedure	2	_____
Part 3	**Spot Repair** ☐ prepares spot repair for painting ☐ selects paint by colour code to match existing colour ☐ applies paint to spot repair	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Interior Finishes and Repairs — MEC222–1

STANDARD: Students working at STANDARD must demonstrate a level 2 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
Part 1	*The student:* **Safety** ☐ follows shop/lab procedures in protection of people and vehicles ☐ lists and follows handling procedures for volatile chemicals ☐ states disposal procedures for chemicals	2	_____
Part 2	**Techniques and Products** ☐ lists, identifies materials and describes repair procedure ☐ lists products and procedures to restore interior surface ☐ lists tools/equipment required for repairs	2	_____
Part 3	**Clean and Repair** ☐ outlines procedures to follow for restoration of a given interior surface ☐ selects tools/equipment and materials for repair ☐ repairs a minor interior surface problem ☐ cleans an interior surface	2	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Buying and Selling a Vehicle — MEC301–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
	The student:		
Part 1	**Determining Vehicle** ☐ states predetermined constraints ☐ selects and states why a particular vehicle is chosen ☐ states how vehicle meets financial, emotional, service constraints	3	_____
Part 2	**Evaluating Selected Vehicle** ☐ inspects vehicle systems/components to determine its' worth ☐ compares inspection data to predetermined constraints ☐ evaluates whether purchase would be within predetermined constraints	3	_____
Part 3	**Buying and Selling** ☐ outlines steps in selling or buying a vehicle ☐ lists steps involved in determining a selling price for a vehicle ☐ develops an advertisement for a vehicle	3	_____
Part 4	**Legal Responsibilities** ☐ states legal steps and implications when buying a vehicle ☐ states legal steps and implications when selling a vehicle	3	_____
Part 5	**Safety** ☐ states safety concerns when purchasing unfamiliar vehicle ☐ states safety concerns when selling a vehicle	3	_____
REFLECTIONS/COMMENTS:			

TASK ASSESSMENT CHECKLIST: Vehicle Value Appraisal — MEC302–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		Standard	Observation
	The student:		
Part 1	**Safety** ☐ follows shop/lab routines ☐ completes inspections in a safe manner	3	_____
Part 2	**Inspecting Vehicle Condition** ☐ inspects all vehicle systems ☐ collects data and reports service/repair requirement ☐ estimates cost of required service/repair	3	_____
Part 3	**Industry Estimating Standards** ☐ lists industry dictated estimating standards ☐ lists problems when estimating to industry standards	3	_____
Part 4	**Repair Estimate** ☐ reports repair estimation to industry standards ☐ reports a vehicle market value	3	_____
Part 5	**Conflicts** ☐ outlines business practice when attempting to resolve conflicts related to estimations and evaluations.	3	_____

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Engine Performance	MEC303–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **No Diagnostic Tools** ☐ evaluates engine performance using sense of touch, hearing (no diagnostic tools).	4 3 2 1 0 N/A
Part 2	**With Diagnostic Tools** ☐ selects and uses diagnostic techniques for engine mechanical, ignition, cooling/exhaust, fuel and emission control systems. ☐ selects and uses tools/equipment and resources.	4 3 2 1 0 N/A
Part 3	**Report** ☐ records test results. ☐ interprets test results. ☐ lists and provides rationale for areas requiring attention. ☐ provides a cost analysis.	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

Module Learner Expectations

The student: Provides a report on the condition of engines diagnosed

SAMPLE ITEM(S) ON REPORT
Engine Mechanical Checks • dry and wet compression test readings for each cylinder • cylinder leakage test for each cylinder • vacuum test with tachometer – idle – acceleration, deceleration • cylinder power balance test • valve adjustment Battery Test Checks • hydrometer • load test • three-minute charge test • cranking voltage test Starting System Checks • cranking current test • insulated/ground circuit Charging System Checks • alternator output test • voltage regulation test • insulated/ground circuit resistance checks Ignition System (oscilloscope check) • point ignition – dwell, point gap/condition, primary voltages • electronic ignition (follow manufacturers recommendations) • secondary ignition – coil output/polarity, distributor cap, rotor, secondary, wires, spark plugs condition, spark timing/advance Fuel System Checks • fuel pump pressure/capacity test • carburetor functions test • fuel injection power balance test Emission Control Check • PVC, ECS, EGR, AIR, computer controlled emission system, exhaust emission check

TASK ASSESSMENT CHECKLIST: Engine Tune-up — MEC304–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Engine Mechanical** ☐ establishes a diagnostic sequence. ☐ selects and uses equipment and resources. ☐ performs mechanical condition test. ☐ interprets data, establishes condition of engine.	4 3 2 1 0 N/A
Part 2	**Fuel System** ☐ establishes diagnostic sequence. ☐ selects and uses diagnostic equipment. ☐ analyzes data and determines service. ☐ services carbureted system ☐ services a fuel injected system.	4 3 2 1 0 N/A
Part 3	**Electrical, Emission, Exhaust** ☐ establishes diagnostic sequence. ☐ selects and uses equipment to diagnose ignition, starting and charging system. ☐ selects and uses equipment to diagnose emission and exhaust system. ☐ analyzes data and determines service. ☐ services ignition, starting and charging systems. ☐ services emission control and exhaust system.	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

SAMPLE ITEM(S) SERVICED DURING TUNE UP	
Part 1: MLE	Determine Engine Mechanical Condition • check engine compression pressures • check and correct engine manifold vacuum readings • check and adjust valve clearances
Part 2: MLE	Check and Service Carburetor/Fuel Injection System • check and change filters • check fuel pump pressure/capacity and correct • check, adjust and clean carburetor • check, clean and/or replace fuel injectors
Part 3: MLE	Use Diagnostic Equipment to Check, Interpret and Service Ignition, Charging, Starting, Emission Control and Exhaust System • check and adjust belt(s) tension • check and/or replace hoses • check and service battery/cables • check and correct alternator output and voltage • check and correct starter current draw and circuit voltage drops • check, clean or replace emission control system components (PCV, AIR, EEC, EGR, catalytic converter) • check and correct exhaust system • other - engine compartment fluids for condition and level, tires and any other items specified in service schedule

TASK ASSESSMENT CHECKLIST: Engine Removal and Installation — MEC305–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Pre-Engine Removal:** ☐ follows prescribed environmental precautions. ☐ prepares for storage of components and fasteners. ☐ uses resources to determine techniques and procedures.	4 3 2 1 0 N/A
Part 2	**Engine Accessories:** ☐ establishes a method of determining how to replace hoses, lines wires, clips, brackets, etc., in their respective locations. ☐ removes and replaces accessories and related components	4 3 2 1 0 N/A
Part 3	**Engine Removal/Replacement** ☐ follows manufacturers recommendations for proper lifting/dropping points on an engine (including fastener precautions). ☐ follows recommended procedures for removing and installing engine. ☐ re-establishes all components including proper torques, routing, alignment, etc.	4 3 2 1 0 N/A
Part 4	**Post Installation:** ☐ installs necessary fluids. ☐ makes appropriate adjustments prior to start-up. ☐ performs start-up and engine run in procedures. ☐ makes final adjustments/corrections before customer delivery.	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

Module Learner Expectations

The student: Identifies steps involved in preparing a vehicle for engine removal.

SAMPLE ITEM(S)

STEPS REQUIRED BEFORE ENGINE REMOVAL

- Determine reason for engine removal (many tasks can be done with engine in chassis).
- Determine location of vehicle allowing for sufficient work space.
- Determine if engine will be removed with or without transmission.
- Determine protection required for painted surfaces.
- Scribe hood hinges.
- Drain engine oil and coolant.
- Disconnect and storage of battery.
- Disconnect and marking all wires, vacuum hoses.
- Remove radiator hoses, radiator and fan.
- Remove drive belts, air cleaner, accessories and any other item(s) preventing removal of engine.
- Determine where to install engine sling, fasteners to use and torque required for sling bolts.
- Use engine hoist, remove weight of engine from chassis.
- Determine whether to remove engine mounts from chassis or engine.
- Determine if transmission is left in:
  - support transmission if removed
  - drain fluid, remove axle shafts/driveshaft
  - speedometer cable.
- If standard transmission, remove clutch linkage/cable/hose.
- Determine how to store fasteners/components.

TASK ASSESSMENT CHECKLIST: Cylinder Head Reconditioning	MEC306–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Cylinder Head Diagnoses (Head Removed):** ☐ selects and uses diagnostic tools to perform checks before disassembly. ☐ interprets data and indicates possible faults.	4 3 2 1 0 N/A
Part 2	**Cylinder Head Service** ☐ disassembles, cleans and stores cylinder head and components.. ☐ performs necessary measurements/checks. ☐ interprets data and determines service required. ☐ performs valve, valve seat and guide service. ☐ assembles cylinder head, checks and adjusts valve spring heights to manufacturers recommendations. ☐ checks/services cylinder head related components	4 3 2 1 0 N/A
Part 3	**Cylinder Head Removal/Installation** ☐ removes cylinder head and related components. ☐ prepares, organizes and stores components.. ☐ installs cylinder head and related components. ☐ makes adjustments before start-up.	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

Module Learner Expectations

The student: Reconditions a cylinder head and related components.

SAMPLE ITEM(S)
WHEN RECONDITIONING CYLINDER HEADS AND RELATED COMPONENTS

Cylinder head work will vary depending on the length of service, cast iron or aluminium, whether overhead cam or not. It is important that a thorough analysis be done to determine the extent of the reconditioning. The following sample list represents a complete reconditioning of cylinder head.

- Head Assembly:
  - Heads are easier to work on if cleaned before disassembly and face protection should be worn when removing valve springs.
  - Items such as valves, springs, retainers, rocker arms, lifters, push rods, camshaft bearing caps, journals must be kept in there original order.
    - Using valve spring compressor, remove valve springs.
    - Measure valve stem height, record and remove valve.
- Carbon Removal:
  - Several methods maybe used to remove carbon such as portable wire wheel/brush scrapers and/or glass bead. Cleaning all surfaces including guides.
- Crack Inspection:
  - Several methods are available such as visual, magnetic dye penetrate or pressure testing.
- Warpage Inspection:
  - Using straight edge and feeler gauge, check warped or bent cylinder head deck.
- Valve Guides Inspection:
  - Several methods can be used including dial indicator, small hole gauge and micrometer. Check for maximum clearance which generally occurs near the top or bottom of the guide - record reading.
- Valve Inspection:
  - Measure valve stem wear with a micrometer and record readings.
- Valve Guide Repair:
  - If clearances are excessive, clearances can be restored in several ways - replaceable guides replaced, integral guides reamed and inserts installed or valves replaced with oversized stems or guides knurled.
- Grinding Valves:
  - Grind valve face to specified angle and check if sufficient valve margin exists. Grind valve stem tip and chamfer
- Grinding or Cutting Valve Seats:
  - Grind to specified angle and check valve face to seat contract and adjust to recommended position and seat width.
  - NOTE: valve seats may require replacement
- Assemble Cylinder Head:
  - Clean head thoroughly, lubricate valve stems, install new valve stem guide seal and assemble valves in head. Check and adjust assembled valve spring height.

Related Components:

- Camshaft:
  - Check for straightness, lobe wear/condition, journal size and wear.
- Camshaft Bearings:
  - Wear and size.
- Lifters:
  - Base condition, bore clearance, if hydraulic, leak down rate.
- Push Rods:
  - Straightness, end wear.
- Rocker Arms and Shaft:
  - Clearance and bore wear, push rod end and valve stem end wear (maybe machined on some rocker arms).
- Camshaft Chain/Sprockets/Gears:
  - Checked for wear.
- Timing Belt:
  - Checked for wear, consult manufacturers recommendations for replacement.
- Manifolds:
  - Check for cracks, warpage, coolant/air passages, carbon build-up, good machined surfaces.

TASK ASSESSMENT CHECKLIST: Cylinder Block Reconditioning	MEC307–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Cylinder Block Inspection/Diagnosis** ☐ selects and uses diagnostic tools to inspect cylinders, pistons, rods, crankshaft, camshaft, bearings and related components. ☐ interprets data and develops plan of action for service. ☐ creates a cost estimate and timeline for service.	4 3 2 1 0 N/A
Part 2	**Cylinder Block Service** ☐ performs cylinder block service on piston(s), rod(s), crankshaft, camshaft and related component service.	4 3 2 1 0 N/A
Part 3	**Cylinder Block Disassembly/Assembly** ☐ disassembles cylinder block observing precautions for reassembly. ☐ prepares, organizes and stores components. ☐ assembles cylinder block and related components to manufacturers recommendations.	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

ILLUSTRATIVE EXAMPLE: Cylinder Block Reconditioning — MEC307–2

Module Learner Expectations

The student will: Recondition a cylinder block and related components.

Note: Cylinder block inspection, service and repair will depend on type of cylinder block. For this module learner expectation, cylinder rebore is not included.

SAMPLE ITEM(S)

FOR CYLINDER BLOCK RECONDITIONING

CYLINDER BLOCK

- Decking of the Block:
  - Draw file the decking surfaces. With straight edge and feeler gauges, check for warpage and cracks.
- Cylinder Bore:
  - Check cylinder bore for taper, out-of-roundness and size (maximum wear 90° to piston pin). Check the cylinder bore for cracks, excessive scuffing or scratches.
  - If cylinder bore checks indicate reuse of block - make certain ring ridge is removed and cylinders are de-glazed (if recommended)
- Lifter Bores:
  - Check size and cleanliness of oil passages.
- Oil Galleries and Coolant Passage:
  - Check for cleanliness and tight plugs.
- Cam Bearings/Bore:
  - Check condition, size and replace if necessary
- Crankshaft:
  - Check for bends, cracks, clear oil passages. Journals are checked for condition, size, taper and out of roundness. If crankshaft does not check-out, it must be reground or polished.
- Pistons:
  - Piston skirts are checked for scuffing, size and taper, if not within manufacturers specifications - replace.
- Piston Grooves:
  - Checked for wear and side clearance (if excessive wear, groove inserts maybe installed).
- Piston Pins:
  - Check for clearance between pin and pin boss (if excessive, oversized pins maybe installed). If equipped with retainers, retainers are checked.
- Connecting Rods:
  - Checked for cracks, twists and bends, large ends are checked for out-of-roundness, taper and size. (If not within specifications, maybe resized. Small end, depending on type (press fit or full floating) checked for size and re-machined/bushed if necessary.)
- Camshaft (if not an overhead valve engine):
  - Check for straightness, lobe condition/lift, journal size, taper and condition.
- Related Components:
  - Check camshaft, chain, sprocket, gears for wear. Check out oil pump internal components for wear/clearances including pressure relief valve, driveshaft, screen, oil pan including plug, windage tray/baffles.

TASK ASSESSMENT CHECKLIST: Alternate Propulsion System — MEC308–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately.
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Historical Development** ☐ reports on historical developments of internal combustion engines including manufacturing techniques	4 3 2 1 0 N/A
Part 2	**Engine Design** ☐ reports on types of engine designs using alternate fuel and alternate engine designs using conventional fuel. ☐ reports on developments in electric powered vehicles	4 3 2 1 0 N/A
Part 3	**Future Developments** ☐ reports on possible areas of future developments in alternative propulsion systems	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Computer Management	MEC309–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals.*
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort.*
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals.*
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonable consistent. Works cooperatively.*
0	Has not completed defined outcomes.

CRITERIA		RATING SCALE
	The student:	
Part 1	**Computer Management System** ☐ identifies common principles of computer management systems ☐ identifies and compares input and output devices used on vehicles with that of PC's	4 3 2 1 0 N/A
Part 2	**Components** ☐ locates CPU and input/output devices ☐ describes the relationship of the CPU and its related components	4 3 2 1 0 N/A
Part 3	**Computer Management Operation** ☐ describes how and what information is gathered and what it is processed to ☐ describes how changed inputs affect outputs	4 3 2 1 0 N/A
Part 4	**Service and Repair** ☐ selects and uses diagnostic equipment to diagnose management system ☐ repairs/replaces components and evaluates system	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Safety System	MEC310–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
	The student:	
Part 1	**Safety Systems** ☐ lists and describes the evolution of safety systems in vehicles ☐ describes possible future developments in safety systems	4 3 2 1 0 N/A
Part 2	**Service and Repair** ☐ selects and uses diagnostic equipment to diagnose safety systems ☐ services and repairs safety systems to manufacturers recommendations	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Climate Control — MEC311–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Climate Control Systems** ☐ identifies parts/components of a heater system. ☐ identifies parts/components of air conditioning system. ☐ describes the function and operation of a heater and air conditioning system. ☐ describes how control systems combine functions to provide hot and cold.	4 3 2 1 0 N/A
Part 2	**Diagnosis, Service and Repair** ☐ selects and uses tools to diagnose climate control systems according to manufacturers recommendations. ☐ services and repairs climate control systems to manufacturers recommendations.	4 3 2 1 0 N/A
Part 3	**Environmental Concerns** ☐ states the effects of refrigerants on the ecosystem. ☐ identifies environmental laws affecting climate control service. ☐ identifies alternate refrigerants indicating advantages and disadvantages.	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

TASK ASSESSMENT CHECKLIST: Power Assisting	MEC312–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Power Assist Components** ☐ identifies power assist systems. ☐ identifies components of power assist system	4 3 2 1 0 N/A
Part 2	**Pneumatic System** ☐ selects and uses tools to diagnose pneumatic power assist system. ☐ selects and uses tools to service/repair pneumatic system/components to manufacturers recommendations.	4 3 2 1 0 N/A
Part 3	**Hydraulic System** ☐ selects and uses tools to diagnose a hydraulic power assist system. ☐ selects and uses tools to service/repair hydraulic system to manufacturers recommendations.	4 3 2 1 0 N/A
Part 4	**Electrical System** ☐ selects and uses tools to diagnose a electrical power assist system. ☐ selects and uses tools to service/repair electrical system to manufacturers recommendations.	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Automatic Transmission	MEC313–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Components and Function** ☐ identifies components ☐ traces power flow through clutches/bands in various gear selector positions ☐ explains how shifting is accomplished	4 3 2 1 0 N/A
Part 2	**Inspection/Service/Repair** ☐ selects and uses tools to diagnose ☐ analyzes and reports on condition ☐ changes transmission fluid and filter ☐ adjusts linkage/bands ☐ removes and replaces a transmission ☐ repairs an automatic transmission	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Power Train Repair	MEC314–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Clutches** ☐ inspects clutch performance ☐ replaces clutch plate/pressure plate and related components following manufacturers recommendations ☐ makes post installation checks and adjustments	4 3 2 1 0 N/A
Part 2	**Standard Transmission** ☐ inspects and determines condition of transmission ☐ removes and replaces a transmission ☐ disassembles and reassembles transmission ☐ on a disassembled transmission, makes inspection/checks and required service/repair	4 3 2 1 0 N/A
Part 3	**Differential** ☐ inspects and determines condition of differential ☐ selects and uses tools to inspect and adjust a differential	4 3 2 1 0 N/A
Part 4	**Drive Axle Assembly** ☐ selects and uses tools to inspect drive axles ☐ removes and replaces drive axles ☐ removes and replaces universal joint(s)	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

TASK ASSESSMENT CHECKLIST: Wheel Alignment	MEC315–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Prealignment** ☐ determines customer need ☐ determines condition of steering components and repair ☐ determines condition of suspension components and repair ☐ analyzes tire wear patterns	4 3 2 1 0 N/A
Part 2	**Alignment Angles:** ☐ identifies six alignment angles (including negative and positive where applicable) ☐ identifies angle adjustment methods and procedures ☐ indicates affects of incorrect angles on vehicle handling and components	4 3 2 1 0 N/A
Part 3	**Alignment Equipment** ☐ follows accepted alignment equipment use ☐ measures alignment angles on a specified vehicle ☐ interprets data, compares to specifications and determines required service ☐ adjusts angles to specifications	4 3 2 1 0 N/A
Part 4	**Post Alignment** ☐ contrasts driving symptoms to prealignment conditions ☐ assesses work performed, condition of vehicle, readiness for customer delivery ☐ reports vehicle status to customer	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

Module Learner Expectations

The student: Identifies measurements and angles that are incorporated into suspension and steering systems.

Note: Alignment angle measurement and adjustment depends on suspension and steering system incorporated in a vehicle.

SAMPLE ITEM(S)

FOR IDENTIFICATION OF ALIGNMENT ANGLES

- Six Fundamental Wheel Alignment Angles:
  - camber (positive and negative)
  - caster (positive and negative)
  - toe (toe-in and toe-out)
  - steering axis inclination
  - toe-out on turns
  - tracking
- Angle Adjustments:
  - camber and caster when vehicle equipped with control arms:
  - shims between control arm and frame
  - slots for bolts between control arm and frame
  - eccentric bolt and cam on control arm
  - ball joint eccentric
  - strut rod - lower control arm (caster only)
  - camber and caster when vehicle equipped with struts:
  - slots in upper strut mount
  - eccentric bolt on spindle mount (camber only)
  - toe:
    - by lengthening and shortening tie rod sleeves/rods
  - tracking:
    - by adjusting rear wheels so they follow front wheels
- Angle Adjustment Sequence:
  - caster, camber and toe-in

Effects of Incorrect Alignment Angles on Vehicle

- Camber:
  - tire shoulder wear, ball joint, wheel bearing wear, pulls to the side with most positive or least negative camber
- Caster:
  - excessive positive:
    - hard steering, excessive road shock, wheel shimmy, pulls to the side with the least positive caster
  - excessive negative:
    - wander and instability, pulls to the side with the most negative caster
- Steering Axis Inclination:
  - instability, poor steering wheel recovery to centre position, pulls to side with the least angle
- Toe:
  - tire wear
- Toe-out-on-turns:
  - tire wear and squeal on turns
- Tracking:
  - steering wheel off centre, wander

NOTE: Defective brakes, tires, suspension and steering components will also affect steering.

TASK ASSESSMENT CHECKLIST: Body Repair Estimation — MEC316–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
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1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Estimating and Legal Obligations:** ☐ defines: insurance, liability, waiver, write-off premium and deductible ☐ understands legal implications when estimating	4 3 2 1 0 N/A
Part 2	**Investigation, Vehicle Construction, Part Costs:** ☐ selects and uses resources ☐ identifies problem solving approach to collision damage ☐ identifies direct and hidden collision damage ☐ identifies accessory parts ☐ sources parts and prices (including original equipment manufacturers and after market)	4 3 2 1 0 N/A
Part 3	**Estimating Procedures** ☐ lists the skills and knowledge required for estimating collision damage to include: visual, measurement, calculation, product knowledge	4 3 2 1 0 N/A
Part 4	**Damage Estimate:** ☐ applies knowledge and skills in estimating a given collision damage ☐ provides a cost analysis including part, labour, shop and miscellaneous costs ☐ provides a comparison between vehicle value and repair costs	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

ILLUSTRATIVE EXAMPLE: Body Repair Estimation MEC316–2

Module Learner Expectations

The student: Completes an estimate to automobile industry standards, including decision on replacement or repair.

SAMPLE ITEM(S)

Damage Report On A Given Damaged Vehicle To Include:

- Zone 1:
  - Primary Damage (near force of impact) to include:
    - grille, hood, fenders, quarter panels, deck lid, doors, pillars, roof, floor pans, bumper systems, component/structural supports, rails
- Zone 2:
  - Secondary damage (damage outside of Zone 1)
- Zone 3:
  - Mechanical damage to components such as:
    - radiator
    - fan
    - power steering pump
    - alternator
    - battery
    - air condition
    - reservoirs
    - engine
    - transmission
    - rear axle
    - driveshaft
    - steering
    - suspension
    - brake system
- Zone 4:
  - Passenger compartment damage to interior trim accessories including operation of all components.
- Zone 5:
  - Exterior trim and finish.

Estimating Parts, Labour and Miscellaneous Costs

- Use crash guides to determine labour and parts costs.
- Determining when component is repaired or replaced.
- Determining when salvage, after market or OEM parts are utilized.
- Determine the total cost of the repair.

Determining Vehicle Value Versus Repair Costs

- Determine actual vehicle cash value (ACV) using a used car guide.
- Determine whether vehicle should be repaired.

TASK ASSESSMENT CHECKLIST: Structural Damage Analysis	MEC317–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Safety:** ☐ follows shop safety procedures including use of personal protective equipment ☐ selects and uses vehicle jacks and stands ☐ follows safe practices in part removal/replacement	4 3 2 1 0 N/A
Part 2	**Damage Types:** ☐ recognizes vehicle construction safety features and its affects on collision damage ☐ recognizes frame types and effects of collision damage ☐ understands secondary and hidden damage ☐ understands methods used to determine damage	4 3 2 1 0 N/A
Part 3	**Measuring for Analysis:** ☐ selects and uses measuring tools and equipment ☐ collects data and evaluates damage ☐ indicates relationship between suspension, alignment and collision	4 3 2 1 0 N/A
Part 4	**Repair Strategy:** ☐ uses a repair estimate and prepares a repair strategy including procedures and sequence	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

TASK ASSESSMENT CHECKLIST: Structural Damage Repair I — MEC318–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Safety:** ☐ follows shop safety procedures including use of personal protective equipment ☐ selects and uses power, welding and cutting tools	4 3 2 1 0 N/A
Part 2	**Removal/Replacement of Parts:** ☐ analyzes part and determines repair sequence ☐ removes and installs parts and accessories ☐ prepares adjacent parts/surfaces for installation	4 3 2 1 0 N/A
Part 3	**Alignment/Preparation:** ☐ determines correct alignment procedure ☐ aligns parts as per established procedures ☐ performs preparation of parts for painting	4 3 2 1 0 N/A
Part 4	**Trim Parts:** ☐ determines cost effective repair method ☐ repairs or replaces trim parts	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

TASK ASSESSMENT CHECKLIST: Structural Damage Repair II — MEC319–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Safety** ☐ follows shop safety procedures including use of personal protective equipment ☐ selects and uses power, hydraulic, welding and cutting equipment	4 3 2 1 0 N/A
Part 2	**Frame, Body Construction and Repair** ☐ explains frame construction ☐ explains unibody construction ☐ explains HSS/HSLA metals characteristics ☐ describes methods used to repair vehicle bodies	4 3 2 1 0 N/A
Part 3	**Frame/Body Straightener** ☐ demonstrates knowledge of measurement charts and parts terminology ☐ uses a bench frame straightening system to measure a chassis	4 3 2 1 0 N/A
Part 4	**Frame/Body Straightening Analysis** ☐ selects and uses resources to evaluate misalignment ☐ analyzes data and determines misalignment ☐ explains misalignment affects on suspension geometry	4 3 2 1 0 N/A
Part 5	**Frame/Body Straightening** ☐ uses bench frame straightening system to correct alignment ☐ selects and uses jacks, welders to align frame/body ☐ aligns and fabricates damaged parts	4 3 2 1 0 N/A
Part 6	**Suspension Alignment** ☐ identifies suspension problems due to collision ☐ understands legal implications when repairing structural damage	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

TASK ASSESSMENT CHECKLIST: Refinishing II	MEC320–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Safety** ☐ follows shop safety procedures and routines ☐ selects and uses auto body shop materials and safety equipment ☐ uses and explains WHIMIS data sheets	4 3 2 1 0 N/A
Part 2	**Refinish Technology** ☐ selects and uses refinish resources ☐ explains base and clear coat systems ☐ explains plastic coatings ☐ explains colour matching using colour code reference	4 3 2 1 0 N/A
Part 3	**Refinish Application** ☐ explains applications of high tech paint systems ☐ applies tu-tone, striped and custom finishes ☐ cleans spray equipment and area ☐ disposes waste products following accepted practices	4 3 2 1 0 N/A

REFLECTIONS/COMMENTS:

TASK ASSESSMENT CHECKLIST: Plastic and Fibreglass — MEC321–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Safety** ☐ follows shop safety procedures and routines ☐ follows safe practices when working with plastics and fibreglass ☐ accesses and explains WHIMIS data sheets	4 3 2 1 0 N/A
Part 2	**Plastics** ☐ describes and determines types of plastics ☐ describes repairs methods available for plastics ☐ describes equipment/materials required to repair plastics	4 3 2 1 0 N/A
Part 3	**Plastic Repair** ☐ performs a plastic weld ☐ performs a plastic bond	4 3 2 1 0 N/A
Part 4	**Fibreglass** ☐ describes and determines types of fibreglass materials including resins and hardeners ☐ describes procedures for doing a repair	4 3 2 1 0 N/A
Part 5	**Fibreglass Repair** ☐ performs a fibreglass repair method	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

TASK ASSESSMENT CHECKLIST: Glass Removal and Installation	MEC322–1

STANDARD: Students working at STANDARD must demonstrate a level 3 as specified in module conditions and criteria. Use the rating scale below to assess student performance.

Rating Scale:

Rating Scale

4	Exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. Quality, particularly details and finishes and productivity are consistent and exceed standards. Leads others to contribute team goals. Analyzes and provides effective client/customer services beyond expectations.
3	Meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. Quality and productivity are consistent. Works cooperatively and contributes ideas and suggestions that enhance team effort. Analyzes and provides effective client/customer services.
2	Meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. Quality and productivity are reasonably consistent. Works cooperatively to achieve team goals. Identifies and provides customer/client services.
1	Meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. Quality and productivity are reasonably consistent. Works cooperatively. Provides a limited range of customer/client services
0	Has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

CRITERIA		RATING SCALE
Part 1	*The student:* **Safety** ☐ follows shop safety procedures and routines ☐ follows prescribed safety procedures when handling glass ☐ follows prescribed steps in disposing broken glass and glass products	4 3 2 1 0 N/A
Part 2	**Glass Technology** ☐ selects and uses glass resources and materials ☐ identifies glass types and function ☐ identifies glass retaining systems including moldings and seals	4 3 2 1 0 N/A
Part 3	**Glass Replacement Procedures** ☐ selects and uses resources for glass replacement ☐ identifies tools and procedures for glass replacement	4 3 2 1 0 N/A
Part 4	**Glass Replacement** ☐ removes and replaces front or rear glass ☐ removes and installs side glass ☐ seals and tests glass installation ☐ demonstrates door glass alignment	4 3 2 1 0 N/A
REFLECTIONS/COMMENTS:		

MECHANICS

SECTION H: LINKAGES/TRANSITIONS

(INTERIM)

TABLE OF CONTENTS

This section of the GSI has been designed to provide an overview of linkages and transitions of CTS modules with a number of organizations. The charts and information presented in this section will assist CTS students and teachers in understanding the potential application of CTS modules as students move into the workplace.

LINKAGES
- With Other CTS Strands H.1
- With Other Secondary Programs H.2

TRANSITIONS
- To the Workplace H.2
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- Mechanics in Junior High H.4
- Mechanics: Connections Across the Curriculum H.5
- Mechanics: Science Objective Match H.6
- Mechanics: Math Objective Match H.10

- Mechanics: Related Occupations H.12
- Mechanics: Alignment with Apprenticeship Trades H.14
- Mechanics: Summary of Related Post-secondary Programs H.15

LINKAGES/TRANSITIONS

The Mechanics strand supports many of the competencies developed in other CTS strands as well as core or other complementary programs. Competencies developed within the Mechanics strand support a wide range of transitions into the workplace or related post-secondary programs.

LINKAGES

With Other CTS Strands

There are direct and indirect linkages with most strands, particularly where understanding and maintenance of equipment/technology are involved. The following represents linkages with other strands:

Agriculture	Landscape and Turf Management, maintenance and safety check on equipment Applications of Agriculture Technology - research applications of technology in agriculture production, processing or marketing
Career Transitions	Safety, job preparation, job maintenance modules Use of project modules to enhance competencies directly or indirectly related to Mechanics
Community Health	First Aid certification
Communications	Study of equipment and maintenance required in communication/printing industry
Construction Technologies	Tool and machine maintenance module Electrical Systems module
Design Studies	Appropriate and effective design solution, particularly as it applies to Modes and Mechanisms module
Enterprise and Innovation	Student identifying opportunities and developing future plans related to Mechanics strand
Electro-Technologies	Electrical/Electronics knowledge and skills that apply to vehicles
Fabrication Studies	Welding/cutting/heating processes used in mechanics, particularly in Auto Body restoration Principles of sheet metal fabrications Principles and practices in machining
Financial Management	Recognizing the need and developing skills in financial management necessary for successful business in Mechanics-related areas
Foods	The maintenance and service skills required for foods-related equipment
Forestry	Career opportunities related to service of Forestry-related equipment
Fashion Design	Knowledge and skills required for vehicle upholstery
Information Processing	Use/understanding of software use Understanding of various information processing tools and processes
Tourism	Research land, air and sea transportation vehicles as used in tourism and career opportunities in maintenance and service

Note that the project modules from the Career Transitions strand may be combined with modules from Mechanics strand to provide increased opportunities for students to develop expertise and refine their competencies in a particular module(s). For example, the project modules could enhance the following:

- engine rebuilding
- complete vehicle brake work
- complete suspension reconditioning
- extensive collision work.

Potential linkages of Mechanics with other CTS strands, determined by course emphasis and area of specialization, are identified in this section (see "Mechanics: Connections with Other CTS Strands", page H.3, and "Mechanics in Junior High", page H.4).

With Other Secondary Programs

Potential linkages of Mechanics with other core and complementary subject areas across the curriculum are identified in this section (see "Mechanics: Connections Across the Curriculum", page H.5, "Mechanics: Science Objective Match", pages H.6-9, and "Mechanics: Math Objective Match", pages H.10-11).

TRANSITIONS

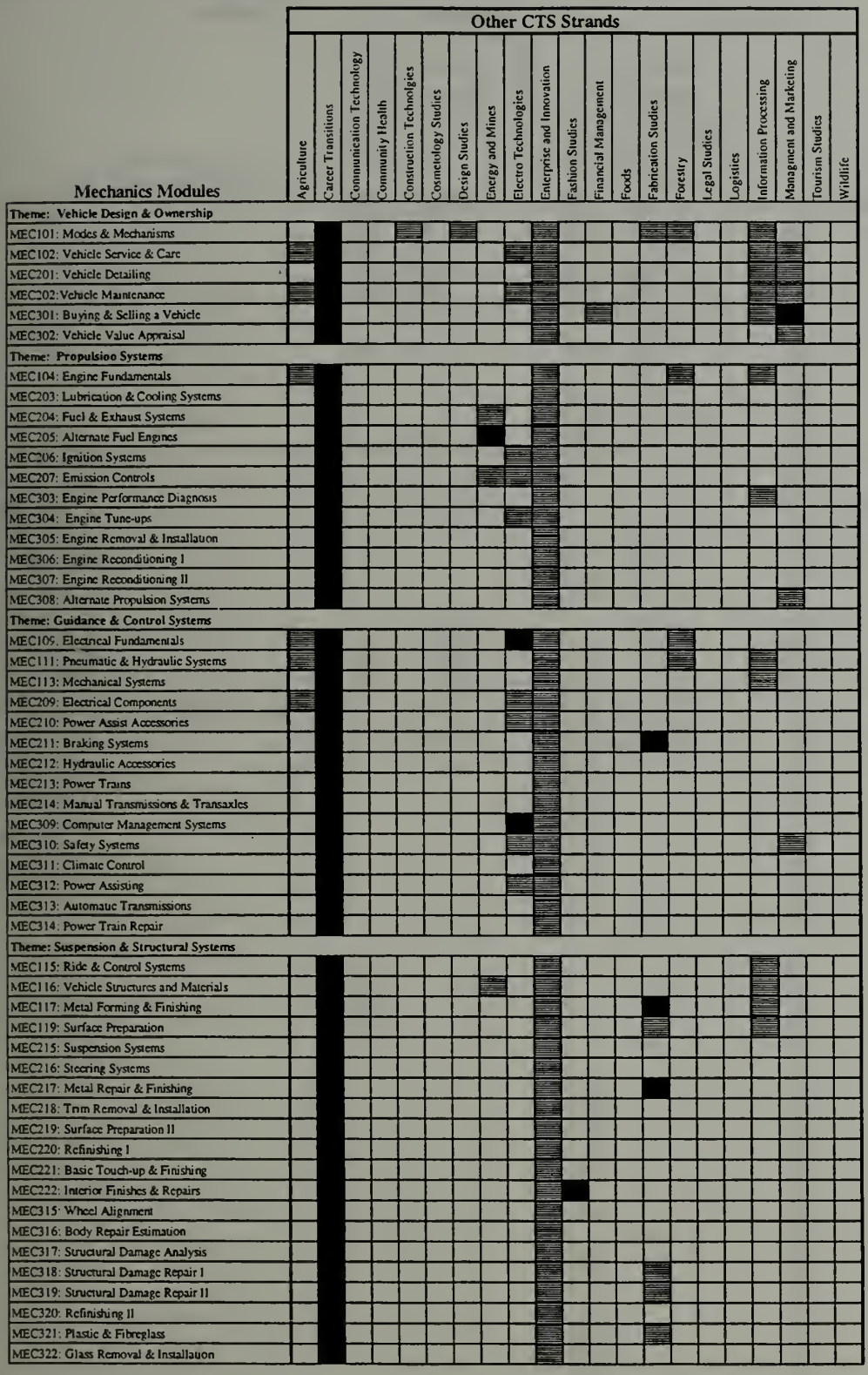
To The Workplace

Information from the National Occupational Classification (NOC) regarding occupations in fashion-related areas that can be accessed upon completion of high school is provided in this section (see "Mechanics: Related Occupations", pages H.12, and "Mechanics: Alignment with Apprenticeship Trades", page H.14).

To Related Post-secondary Programs

There is articulation between Mechanics and numerous programs offered at the post-secondary level. The intermediate and advanced level modules provide students with some indication as to whether they would be interested in entering one of the fashion-related courses at the college or university level. An outline of post-secondary institutions in Alberta currently offering programs in fashion-related areas is provided in this section (see "Mechanics: Summary of Related Post-secondary Programs", pages H.15-16).

LINKAGES – *Mechanics: Connections With Other CTS Strands*

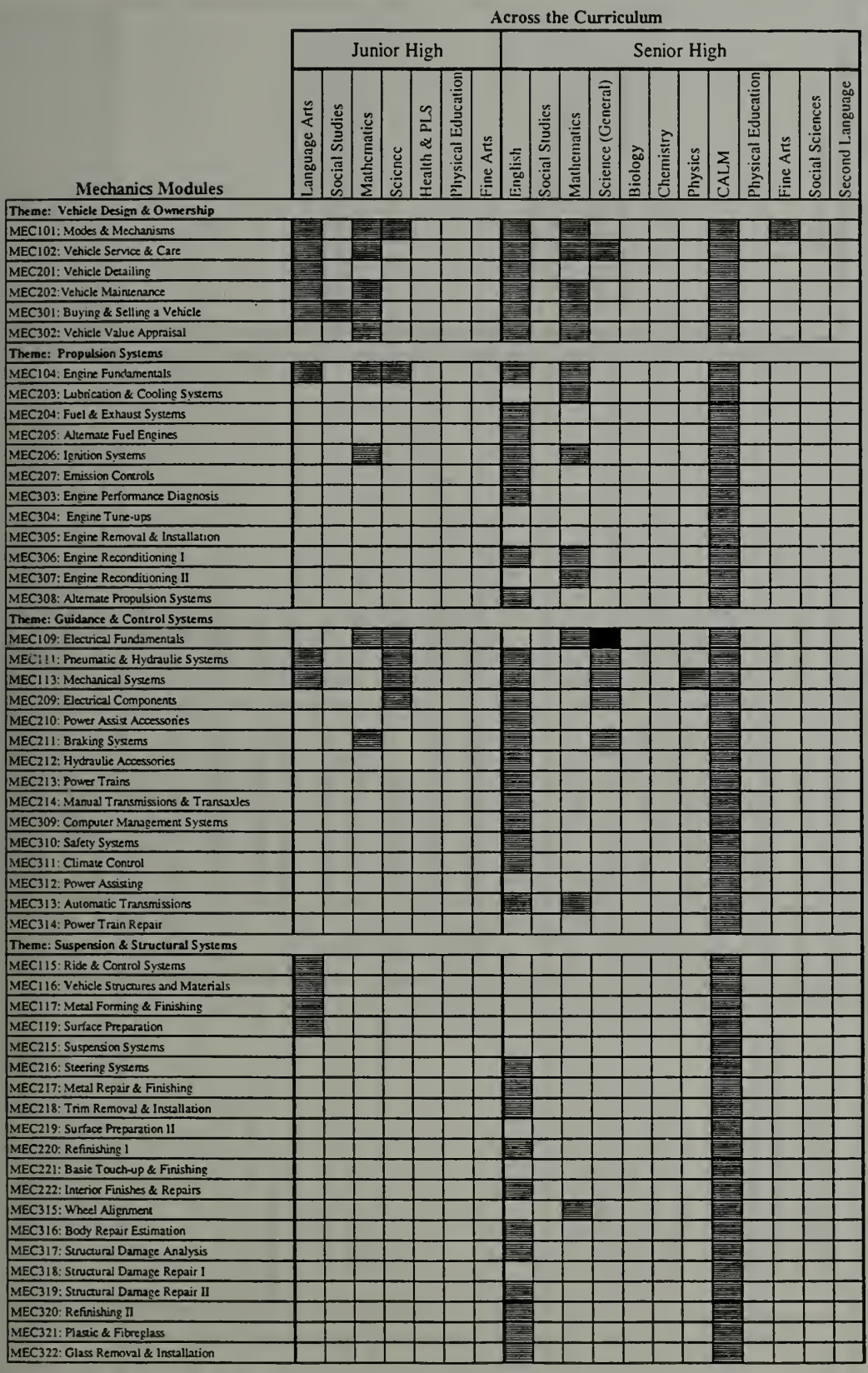


Provides many direct links with competencies in this strand. Students will reinforce, extend and apply a substantial number of knowledge and/or skill components in practical situations.

Provides some links with competencies developed in this strand, usually through the application of related technologies and/or processes.

Course Emphasis	Mechanics Modules	Electro-Technologies Modules	Communication Technology Modules	Design Studies Modules
Vehicle Ownership (3 modules)	Modes & Mechanisms Vehicle Service & Care	Electro-Assembly I		
Engine / Motors (4 modules)	Modes & Mechanisms Vehicle Service & Care Engine Fundamentals	Electro-Assembly I		
Electricity / Electronics (5 modules)	Modes & Mechanisms Electrical Fundamentals	Electro-Assembly I		Sketching, Drawing & Modelling - Fundamentals The Design Process
Energy Conversion / Uses (6 modules)	Modes & Mechanisms	Electro-Assembly I	Media & You	Sketching, Drawing & Modelling - Fundamentals The Design Process

LINKAGES – *Mechanics: Connections Across the Curriculum*



Provides many direct links with course content. Students will reinforce, extend and apply a substantial number of knowledge and/or skill components in practical contexts.

Provides some links with course content, usually through the application of related technologies and/or processes.

CSB: 96 06 07

MECHANICS		SCIENCE			ACTIVITY
Module	**Module Learner Expectations**	**Crs**	**Unit**	**Concept/Skill**	
MEC101	• planning and designing a transportation vehicle • understand propulsion systems • forces to be overcome in the motion of a vehicle	Sc8	Energy and Machines	Concepts 2, 3, 5	• construct models to demonstrate the scientific principles.
		Sc10	Energy and Change	Concept 1 and 2	
		Sc14	Understanding Technology	Concept 1.2	
		Sc16	Technology at Work	Concepts 2, 3, 4, 5	
		Sc20	Changes in Motion	Concept 1 and 4	• scale drawings and numerical calculations • algebraic and graphic representations
		Ph20	Kinematics and Dynamics	Concept 1	
		Sc24	Safe Transportation	Concepts 1.1-4	
		Sc26	Technology at Work	Concepts 1.1, 1.2, 1.4	
		Ph30	Conservation Laws	Concepts 1 and 2	
MEC102	• Care and service of a motor vehicle • Vehicle body cleaning and treatment	Sc9	Chemical Properties and Change	Concepts 5, 6	• investigate the reaction of salt and water on unprotected metal • illustrate examples of corrosion
		Sc10	Matter and Energy in Climatic Change	Concept 3.1	
		Sc20	Chemical Changes	Concept 3.1	
		Sc24	Safe Transportation	Concept 3.4	
		Sc26	Technology at Work	Concept 3	
		Ch20	Chemical Bonding in Matter	Concept 1	• experiments related to the activity series of metals

MECHANICS		SCIENCE			ACTIVITY
Module	**Module Learner Expectations**	**Crs**	**Unit**	**Concept/Skill**	
		Ch30	Electro-chemical Changes	Concept 2	
MEC104	Engine fundamentals and the principles of internal and external combustion engines	Sc7	Force and Motion	Concept 1	
		Sc8	Energy and Mechanics	Concept 1	
		Sc10	Matter and Energy in Chemical Change	Concepts 1, 2, 3, 4	• experiments to demonstrate energy involvement in the change of matter
		Sc14	Understanding Technology	Concepts 3, 4	
		Sc16	Technology at Work	Concepts 2, 3, 4, 5, 6	
		Sc16	Understanding the Environment	Concepts 3, 5, 6 and 7	
MEC109	• methods of producing electricity • understanding basic electrical circuit drawings • knowing basic electrical terminology	Sc9	Electro-Magnetic Systems	Concepts 3, 4, 5	• construct a simple electrical source • construction of a simple electro-magnetic or St. Lewis motor
		Sc16	Technology at Work	Concept 2, 3	
		Sc26	Technology at Work	Concept 1, 2	
		Sc26	Understanding our Environment	Concepts 1, 2, 6	
		Sc30	Electro-magnetic Energy	Concepts 1, 2, 3, 4	
		Sc30	Energy and the Environment	Concept 1	
		Ph30	Nature of the Atom	Concepts 1, 4	

MECHANICS		SCIENCE			ACTIVITY
Module	**Module Learner Expectations**	**Crs**	**Unit**	**Concept/Skill**	
MEC109 (continued)		Ph30	Magnetic Forces and Fields	Concepts 1, 2, 3	
		Ph30	Electric Forces and Fields	Concepts 1, 2, 3, 4	
MEC110		Sc7	Forces and Motion	Concept 1	
MEC111	• pneumatic and hydraulic symbols and circuit drawings • use of pneumatics and hydraulics to change size direction and location of fluid force • relationship between flow rate and process	Sc9	Fluids and Pressure	Concepts 1, 2, 3, 4	• construct valves • assemble tubing to observe flow rate and pressure
MEC113	• identification of mechanisms that change size, direction, and location of mechanical force • understand the co-efficient of friction • mechanical energy can be changed	Sc8	Energy and Mechanics	Concepts 2, 4, 5	• design and construct a simple machine to perform a task • identify tools and devices that redirect mechanical force • perform experiments to demonstrate the force of friction • calculate the mechanical advantage of a machine
		Sc10	Energy and Change	Concept 1, 2, 4	• illustrate examples of mechanical energy • perform and experiment to convert mechanical energy to heat energy
		Sc14	Understanding Technology	Concepts 2, 3, 4	• illustrate examples of scientific principles in modern devices
		Sc16	Technology at Work	Concepts 1 – 6	

MECHANICS		SCIENCE			ACTIVITY
Module	**Module Learner Expectations**	**Crs**	**Unit**	**Concept/Skill**	
MEC113 (continued)		Ph20	Kinematics and Dynamics	Concept 3	• perform experiment investigating the relationship among mechanical energy, work and power
		Ph30	Conservation Laws	Concept 1	
MEC116	• identification and strategies used in the design and the determination of materials used in vehicle construction • structural coating • recycling of materials	Sc7	Structure and Design	Concepts 3, 4, 5, 6	• design and construct a model vehicle • provide examples of material coatings • identify vehicle components which may be recycled
		Sc16	Technology at Work	Concepts 5, 6	
		Sc16	Understanding Our Environment	Concepts 5, 6, 7	• example of the components of a vehicle that may be recycled
		Sc24	Materials and Products	Concepts 1 – 6	
		Sc30	Chemistry in the Environment	Concept 1	

MECHANICS		MATH			ACTIVITY
Module	**Objective/Concept**	**Course**	**Unit**	**Concept/Skill**	
MEC101 Modes and Mechanism	Research and design a transportation vehicle for specific need and application.	Math 7 Math 8 Math 9		Constructs geometric designs using tools such as a computer, compass, straightedge ruler or mira. Maintains previously developed skills (linear, area, volume, capacity, mass units of measure; classification of polygons: perimeter and area of polygons and the circle; volume of a right rectangular prism and cube). Use the formula $A=\pi r^2$ to determine indirectly, the area of a circle given its radius or diameter. Manipulates a given formula to change the subject of the formula. Express equivalent measures of SI units (linear).	Plan, design, CO_2 car to specs. Building CO_2 car to specifications, test speed using formula distance/time. Research, design, or build alternative produced vehicles, i.e., hovercraft.
MEC102 Vehicle Care	Create a service schedule for a vehicle as a means of preventive maintenance. Inspect and service a vehicle as outlined in the vehicle service schedule	Math 7 Math 8-9	•Ration and Proportion •Data Management	Demonstrates a knowledge and understanding of the use and purposes of statistics as it affects daily living. Collects and records data (tally sheets and frequency tables) Compare two quantities using ratios in the form a/b and a to b.	Itemize needed services to the vehicle according to the specifications laid out in the service manual. Using information from the manual, design a spread sheet that outlines both short and long term maintenance. Include in the spread sheet, estimated costs inventory and annual expenses related to vehicle maintenance. Perform needed service maintenance to the vehicle as outlined in the service schedule.

MECHANICS		MATH			ACTIVITY
Module	**Objective/Concept**	**Course**	**Unit**	**Concept/Skill**	
MEC104 Engine Fundamentals	Analyze and compare the operating principles of common engines.	Math 7-8-9	•Ration •Volume •Displace-ment	Number Systems and Operations, Whole Numbers, Decimals, Measurement and Geometry, Data Management, Ratio and Proportion.	With the aid of proper modules and diagrams, compare operating principles of the internal combustion engine as it compares to the diesel and rotary engines. Compare compression ratios, engine displacement and various fuel systems.
		Math 8	•Measure-ment •Data Management	Rational Numbers, ratio and Proportions, Measurement and Geometry, Data Management.	
		Math 9	•Measure-ment	Number Systems and Operations, Ratio Proportion Measurement and Geometry.	Using a variety of measuring devices, i.e., sliding, calliper, micrometer, telescoping and feeler gauges, dial indicators, determine the condition of various engine components as they relate to proper engine specifications.

TRANSITIONS – *Mechanics: Related Occupations*

Information for this chart was obtained from the National Occupations Classification (NOC) descriptions:

Educational Requirements:

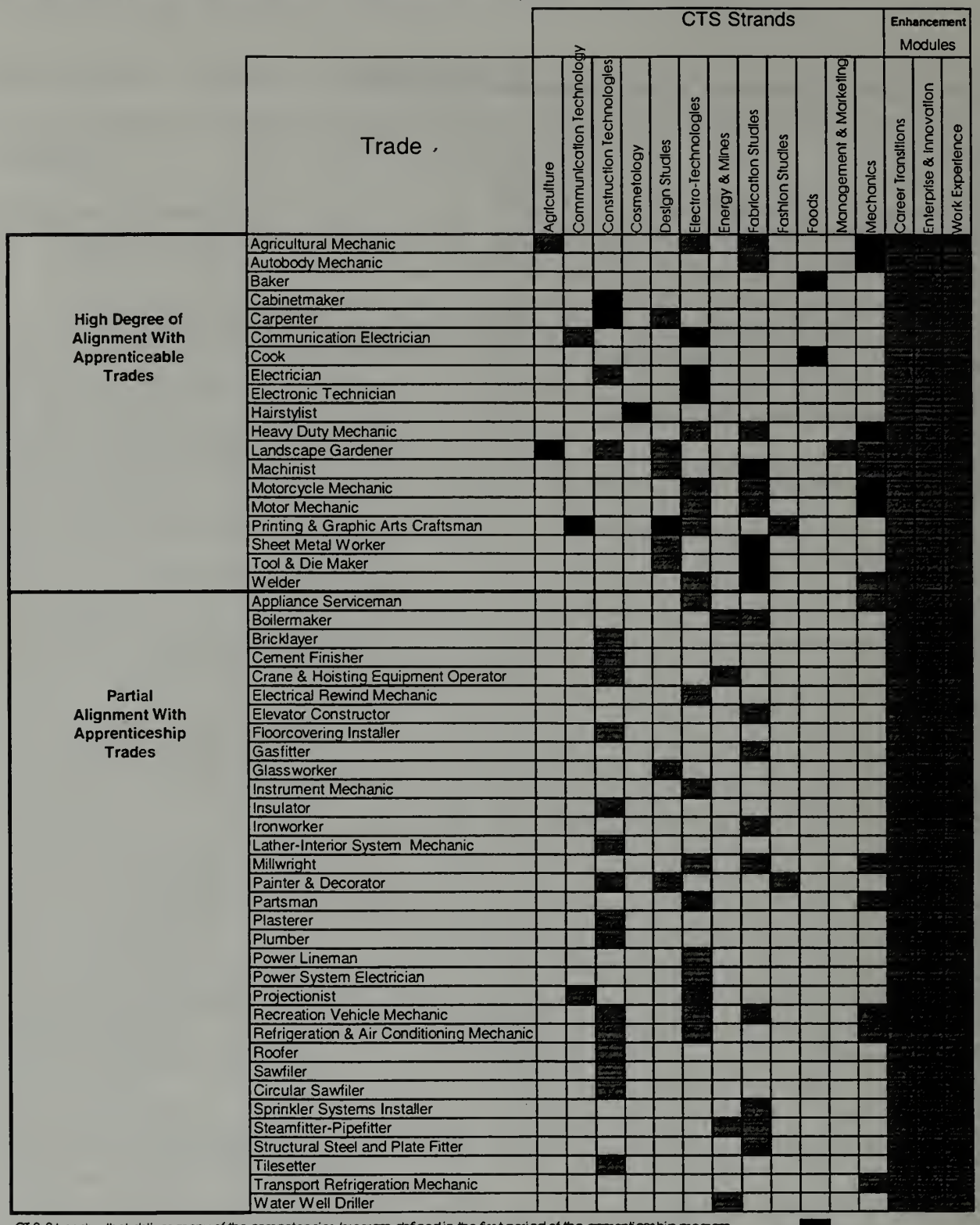
D: High School Education
C: Apprenticeship
B: College or Vocational Education
A: University

Occupational Profile	NOC#	D	C	B	A
Agriculture Mechanic/Farm Equipment Mechanics	7216		✓	✓	
Aircraft Maintenance Engineers	7315	✓		✓	
Appliance Servicemen	7332		✓	✓	
Assemblers, Fabricators and Inspectors, Industrial Electrical Motors and Transformers	9485	✓		✓	
Auto Body Mechanics	7322		✓	✓	
Automotive Mechanical Installers and Servicers	7321	✓			
Carmen	7314	✓			
Construction Millwright and Industrial Mechanics (except Textile)	7311		✓	✓	
Contractors and Supervisors, Mechanic Trades	7216		✓	✓	
Electronic Assemblers, Fabricators, Inspectors and Testers	9483	✓			
Elevator Constructors and Mechanics	7318		✓	✓	
Heavy Duty Equipment Mechanics	7312		✓	✓	
Industrial Instrument Technicians and Mechanics	2243		✓	✓	
Machine Fitters	7316		✓	✓	
Machine Operators and Inspectors, Electrical Apparatus Manufacturing	9487	✓			
Machinists and Machining and Tooling Inspectors	7231		✓	✓	
Maintenance Managers	0722			✓	✓
Manufacturing Managers	0911			✓	✓
Mechanical Assemblers and Inspectors	2244	✓			
Mechanical Engineers	2132				✓
Mechanical Engineering Technologists	2232			✓	
Motor Mechanics	7321		✓		
Motorcycle Mechanics	7334		✓		
Motor Vehicle Body Repairs	7322		✓	✓	
Motor Vehicle Mechanics, Technicians and Mechanical Repairers	7322		✓	✓	
Oil and Solid Fuel Heating Mechanics	7331		✓	✓	
Other Small Engine and Equipment Mechanics	7335		✓	✓	
Other Trades and Related Occupations	7383		✓	✓	
Other Trades Helpers and Labourers	7612	✓			

TRANSITIONS – *Mechanics: Related Occupations (continued)*

Partsmen	1472		✓	✓	
Power Engineers	7351				✓
Refrigeration and Air Conditioning Mechanics	7313		✓	✓	
Recreation Vehicle Mechanics	7383		✓	✓	
Storekeepers and Parts Clerks	1472	✓		✓	
Supervisors, Machinists and Related Occupations	7211		✓	✓	
Supervisors, Motor Vehicle Assembling	9221	✓			
Supervisors, Other Mechanical and Metal Products Manufacturing	7211	✓			
Textile Machinery Mechanics and Repairers	7317	✓			
Tool and Die Makers	7232		✓	✓	
Transportation Refrigeration Mechanic	7313		✓	✓	

TRANSITIONS – *Mechanics: Alignment with Apprenticeship Trades*



CTS Strands - that deliver many of the competencies /program defined in the first period of the apprenticeship program

CTS Strands - that deliver some of the competencies /program defined in the first period of the apprenticeship program

	PUBLIC COLLEGES											APPRENTICESHIP TRADE	PRIVATE COLLEGES						TECH. INST.		Banff	UNIVERSITIES				VOCATIONAL COLLEGES			
	Alberta College of Art & Design	Fairview College	Grande Prairie Regional College	Grant MacEwan Community College	Keyano College	Lakeland College	Lethbridge Community College	Medicine Hat College	Mount Royal College	Olds College	Red Deer College		Alberta College	Augustana University College	Canadian Union College	Concordia College	King's University College, The	North American Baptist College	Northern Alberta Institute of Technology	Southern Alberta Institute of Technology	Banff Centre	Athabasca University	University of Alberta	University of Calgary	University of Lethbridge	AVC - Calgary	AVC - Edmonton	AVC - Lac La Biche	AVC - Lesser Slave Lake
Aeronautical/Mechanical Engineering Technology																				CD (3y)									
Aircraft Maintenance Engineering/Engineers Technology																			V	VD									
Aviation/Avionics Technology								D	D		D								C	D									
Computer Maintenance/Repair																			CD	V									
Mechanical Engineering Technologies							D												D	D									
Other Construction-related Apprenticeship Trades (including Lather-Interior Systems Mechanic)												3y																	
Other Electrical Trades (including Instrument Mechanic)												4y								28w									
Agricultural Mechanic						C(16 w)				D		2y																	
Appliance Serviceman												3y																	
Auto Body Technician												3y																	
Heavy Equipment Technicians (including Diesel Mechanics, Industrial Heavy Equipment Technician/Technology, Journeyman updating & Pre-employment)		VC			8w	C(16 w)	C				30w	4y							CD	C									
Machinist												4y							C										
Marine Service Technician		C																											

CODES:

B	Bachelor's Degree	D	Diploma (2 years)	w	weeks
M	Master's Degree	V	Varies	m	months
Ph.D.	Doctoral Degree	1t	One-year transfer	y	years
C	Certificate (1 year or less)	2t	Two-year transfer		

TRANSITIONS – *Mechanics: Summary of Post-secondary Programs (continued)*

	PUBLIC COLLEGES											APPRENTICESHIP TRADE	PRIVATE COLLEGES						TECH. INST.		Banff	UNIVERSITIES				VOCATIONAL COLLEGES			
	Alberta College of Art & Design	Fairview College	Grande Prairie Regional College	Grant MacEwan Community College	Keyano College	Lakeland College	Lethbridge Community College	Medicine Hat College	Mount Royal College	Olds College	Red Deer College		Alberta College	Augustana University College	Canadian Union College	Concordia College	King's University College, The	North American Baptist College	Northern Alberta Institute of Technology	Southern Alberta Institute of Technology	Banff Centre	Athabasca University	University of Alberta	University of Calgary	University of Lethbridge	AVC - Calgary	AVC - Edmonton	AVC - Lac La Biche	AVC - Lesser Slave Lake
Automotive Service Technicians		C			8w	C(12 w)	D	8w			D	4y							C	VD									
Motorcycle Mechanic/Specialty Mechanics		C										4y																	
Recreation Vehicle Mechanic												3y																	
Refrigeration and Air Conditioning Mechanic												4y																	
Transport Refrigeration Mechanic												3y																	

CODES:					
	B	Bachelor's Degree	D	Diploma (2 years)	w weeks
	M	Master's Degree	V	Varies	m months
	Ph.D.	Doctoral Degree	1t	One-year transfer	y years
	C	Certificate (1 year or less)	2t	Two-year transfer	

*Information taken from "It's About Time: To Start Thinking About Your Future", Advanced Education and Career Development, 1995.

MECHANICS

SECTION I: LEARNING RESOURCE GUIDE

(INTERIM)

TABLE OF CONTENTS

This section of the GSI has been designed to provide a list of resources that support student learning. Three different types of resources are identified:

- Authorized: Resources authorized by Alberta Education for CTS curriculum; these resources are categorized as basic, support, or teaching
- Other: Titles provided as a service to assist local jurisdictions to identify resources that contain potentially useful ideas for teachers. Alberta Education has done a preliminary review of these resources, but further review will be necessary for use in school jurisdictions
- Additional: A list of local and provincial sources of information available to teachers, including the community, government agencies, resource centres and organizations.

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- CTS and the Resource-Based Classroom I.1
- Purpose and Organization of this Document I.1
- How to Order I.2
- Resource Policy I.2

AUTHORIZED RESOURCES I.3
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INTRODUCTION

CTS AND THE RESOURCE-BASED CLASSROOM

Career and Technology Studies (CTS) encourages teachers to establish a resource-based classroom, where a variety of appropriate, up-to-date print and non-print resources are available. Learning resources identified for CTS strands include print, software, interactive videos, manipulatives, student learning guides and tutorials.

The resource-based classroom approach accommodates a variety of instructional strategies and teaching styles, and supports individual or small group planning. It provides students with opportunities to interact with a wide range of information sources in a variety of learning situations. Students in CTS are encouraged to take an active role in managing their own learning. Ready access to a strong resource base enables students to learn to screen and use information appropriately, to solve problems, to meet specific classroom and learning needs, and to develop competency in reading, writing, speaking, listening and viewing.

PURPOSE AND ORGANIZATION OF THIS DOCUMENT

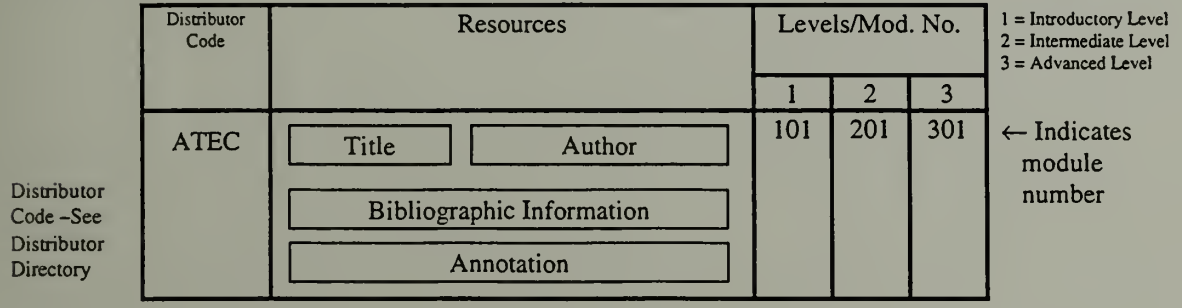
The purpose of this document is to help teacher identify a variety of resources to meet their needs and those of the students taking the new Mechanics curriculum. It is hoped that this practical guide to resources will help teachers develop a useful, accessible resource centre that will encourage students to become independent, creative thinkers.

This document is organized as follows:

- Authorized Resources
  - basic learning resources
  - support learning resources
  - teaching resources
- Other Resources
- Additional Sources.

Some resources in the guide have been authorized for use in some or all of the CTS strands, e.g., the 11 video Career and Technology Studies series produced by ACCESS: The Education Station. Full information is provided in the appropriate section of this resource guide.

Each resource in the guide provides bibliographic information, an annotation where appropriate, and a correlation to the Mechanics modules. The distributor code for each entry will facilitate ordering resources. It is recommended that teachers preview all resources before purchasing, or purchase one copy for their reference and additional copies as required.



HOW TO ORDER

Most authorized resources are available from the Learning Resources Distributing Centre (LRDC) at:

12360 – 142 Street
Edmonton, AB
T5L 4X9
Telephone: (403) 427–2767
Fax: (403) 422–9750

Please check LRDC for availability of videos.

The section on Additional Sources lists a variety of other places to find information related to this strand. In addition, at the back of this document is a Distributor Directory, which contains the name and address of each publisher/distributor referred to in the resource list. Note that in some cases a resource may be published by one company but distributed through another.

The information contained is as complete and accurate as possible.

RESOURCE POLICY

For further information on resource policy and definitions, refer to the *Student Learning Resources Policy* and *Teaching Resources Policy* or contact:

Learning Resources Unit
Curriculum Standards Branch
Alberta Education
5th Floor, Devonian Building, East Tower
11160 Jasper Avenue
Edmonton, AB
T5K 0L2
Telephone: (403) 422–4872
Fax: (403) 422–0576

AUTHORIZED RESOURCES

BASIC LEARNING RESOURCES

The following basic learning resources have been authorized by Alberta Education for use in the Mechanics curriculum. These resources address the majority of the learner expectations in one or more modules and/or levels. A curriculum correlation appears in the right-hand column.

Distributor Code	Resources	Levels/Module No.		
		1	2	3
LRDC	*Auto Body Repair and Finishing,* (3rd edition.) John W. Hogg. McGraw-Hill Ryerson, 1988. Introduces vehicle body repair; includes of practical and theoretical aspects required in the repair industry.	109 116 117 119	215 216 to 220 222	319 321
LRDC	*Car Care Book, The*, (2nd edition.) Fred Barbarossa and G. Bono Savero. Nelson Publishers, 1988. Supports a general interest in mechanics. Reading level and content correlates well with introductory modules. An instructor's guide is available.	102 104 109 111 113 115	202	301 302
LRDC	*Modern Automotive Technology.* James E. Duffy. Irwin Publishing, 1994. The resource provides an easy-to-understand, up-to-date book summarizing the operation and repair of all makes and models of vehicles. The resource uses a "building block" approach that starts with the simple and progresses gradually to the more complex. The resource is divided into 12 sections and 76 chapters. Each automotive system is presented in two or more chapters. A student workbook contains 76 short answers content tests and 17 job sheets. A teacher's resource binder and instructor's guide are available.	101 102 104 109 115	202 203 204 to 216	303 to 315
LRDC	*Motor Auto Body Repair.* Robert Scharff. Nelson Publishing, 1992. Covers auto body repair, with excellent diagrams and resources. An instructor's guide is available.	116 117 119	217 to 221	316 to 322

SUPPORT LEARNING RESOURCES

The following support learning resources are authorized by Alberta Education to assist in addressing some of the learner expectations of a module or components of modules.

Distributor Code	Resources	Levels/Module No.		
		1	2	3
LRDC	*Auto Electricity, Electronics, Computers.* James Duffy. Goodheart-Willcox Co. Inc., 1989. Text and Student Workbook. Provides principles, diagrams, testing and repair of major electrical/electronic systems on a vehicle. Workbook has 28 chapters of electrical-electronic principles, diagrams, testing with sample ASE questions. An instructor's guide is available.	109	206 209	303 304 308 to 311
LRDC	*Auto Engines.* James Duffy and John Hurt. Goodheart-Willcox Co. Inc., 1988. Text and Student Workbook. In-depth coverage of engine principles, diagnosis and service. Workbook contains 30 chapters of short answer questions related to engines with sample ASE questions and suggested activities. An instructor's guide and answer key are available.	104 109	202 to 207 209	303 to 307
LRDC	*Auto Fuel and Emission Control Systems Technology.* James Duffy and J. Smith. Goodheart-Willcox Co. Inc., 1992. Text and Student Workbook. Covers fuel and emission control systems and is supplemented by the workbook. An instructor's guide is available.		204 207	303 304
LRDC	*Auto Shop Safety.* Meridian Education Corporation. McIntrye Media Ltd., 1992. Video. This video is designed to give basic safety instruction using the following sections: shop areas; types of accidents; tools and safety; general safety.	102 104 109 111 113		
LRDC	*Automatic Transmission: A Text-Lab Manual* (2nd edition.) Sheldon L. Abbott. Glencoe Publishing Company, 1989. Text and Lab Manual. Covers theory, diagnosis, in-car service and overhaul of automatic transmissions including transaxles. An instructor's manual is available.		202	313
LRDC	*Automotive Air Conditioning and Heating: A Text-Lab Manual* Ivan Hinerman and Thomas Birch. Glencoe Publishing Company, 1987. Text and Lab Manual. A broad overview of heating and refrigeration systems is presented and service procedures are well documented. An instructor's guide is available.		202	311

Support Learning Resources (continued)

Distributor Code	Resources	Levels/Module No.		
		1	2	3
LRDC	*Automotive Technology: A Systems Approach.* Jack Erjavee and Robert Scharff. Delmar Publishers, 1992. Text and Tech Manual. A comprehensive resource covering many of the modules. Has excellent illustrations with many coloured diagrams. Supporting material, workbook and test banks on computer disc. An instructor's guide is available.	102 104 109 111 115	202 to 216	303 to 315
ACC	*Career and Technology Studies: Key Concepts.* Edmonton, AB: ACCESS: The Education Station. Series of videos and utilization guides relevant to all CTS strands. Series consists of *Anatomy of a Plan, Creativity, Electronic Communication, The Ethics Jungle, Go Figure, Innovation, Making Ethical Decisions, Portfolios, Professionalism, Project Planning, Responsibility* and *Technical Writing.*	all	all	all
LRDC	*Complete Automotive Welding Metals and Plastics.* Robert Scharff and Dave Caruse. Delmar Publishers, 1990. This resource covers welding safety, MIG welding, oxyacetylene, plasma arc, TIG, spot welding, brazing, plastic welding and fibreglass repair techniques. An instructor's guide is available.		217	321
LRDC	*Complete Engine Performance and Diagnostics.* Robert Scharff. Delmar Publishers, 1989. Text and Student Technician's Shop Manual. Covers engine performance, especially electrical components. An instructor's guide is available.		203 204 206 207 209	303 304
LRDC	*Complete Under Car Systems: Steering and Suspension.* Scharff, Robert. Delmar Publishers, 1989. Text and Student Technician's Shop Manual. Excellent coverage of steering suspension, drive shaft, tires, wheels and under-car inspection. Manual includes questions and job sheets for chapters covered in the text. An instructor's guide is available.	115	210 212 215 216	314 315
LRDC	*Engineering Technology: Hydraulics and Pneumatics, Part I and Part II.* (IBM version) Shopware Educational Systems. Computer Discs (6), 1993. Courseware. Computer programs in two parts. Part I: introduction to fluid power; scientific principles of fluids; hydraulics. Part II: pneumatics; graphic symbols; advantages of fluid power. Both Part I and Part II have three sections with approximately 31 visuals and print, and 10 question quiz for each section. Program records student score for each section and tells the student to repeat lesson if he/she fails.	111		

Support Learning Resources (continued)

Distributor Code	Resources	Levels/Module No.		
		1	2	3
LRDC	*I-Car Unibody Collision Repair.* Delmar Publishers, 1992. A comprehensive resource for unibody collision repair and refinishing. An instructor's guide is available.	116 117 119	217 218	317 to 322
LRDC	*Modern Automotive Technology.* James E. Duffy. Irwin Publishing, 1994. Student Workbook. See Basic Learning Resources for annotation and module correlation.			
LRDC	*Small Gas Engines.* Alfred Roth. Goodheart-Willcox Co. Inc., 1992. Text and Workbook. Colour photos, holograms front cover and precise clear sections of text focused on the design, structure and repair of small engines makes this an excellent text. An instructor's guide is available.	104	203 204 206	

TEACHING RESOURCES

The following teaching resources are authorized by Alberta Education to assist teachers in the instructional process.

Distributor Code	Resources	Levels/Module No.		
		1	2	33
LRDC	*Auto Electricity, Electronics, Computers.* James Duffy and N. Henke-Konopasek. Goodheart-Willcox Co. Inc., 1992. Instructor's Guide. See Support Learning Resources for annotation and module correlation.			
LRDC	*Auto Engines.* James Duffy. Goodheart-Willcox Co. Inc., 1988. Instructor's Guide. See Support Learning Resources for annotation and module correlation.			
LRDC	*Auto Fuel and Emission Control Systems Technology.* James Duffy and H.B. Smith. Goodheart-Willcox Co. Inc., 1992. Instructor's Guide. See Support Learning Resources for annotation and module correlation.			
LRDC	*Automatic Transmissions: A Text-Lab Manual* (2nd edition.) Sheldon L. Abbott. Glencoe Publishing Co., 1988. Instructor's Manual. See Support Learning Resources for annotation and module correlation.			
LRDC	*Automotive Air Conditioning and Heating.* Ivan Hinerman and Thomas Birch. Glencoe Publishing Company, 1988. Instructor's Manual. See Support Learning Resources for annotation and module correlation.			
LRDC	*Automotive Technology: A Systems Approach.* Jack Enjavec and Robert Scharff. Delmar Publishers, 1992. Instructor's Guide. See Support Learning Resources for annotation and module correlation.			
LRDC	*Car Care Book, The.* Fred Barbarossa and G. Bono Savero. Nelson Publishers, 1988. Instructor's Guide. See Basic Learning Resources for annotation and module correlation.			
LRDC	*Complete Automotive Welding Metals and Plastics.* Robert Scharff and Dave Caruse. Delmar Publishers, 1990. Instructor's Guide. See Support Learning Resources for annotation and module correlation.			
LRDC	*Complete Engine Performance and Diagnostics.* Robert Scharff. Delmar Publish, 1989. Instructor's Guide. See Support Learning Resources for annotation and module correlation.			

Teaching Resources (continued)

Distributor Code	Resources	Levels/Module No.		
		1	2	3
LRDC	*Complete Under Car Systems: Steering and Suspension.* Robert Scharff. Delmar Publishers, 1989. Instructor's Guide. See Support Learning Resources for annotation and module correlation.			
LRDC	*Design and Technology.* Colin Coborn, Ian Mould and John Cave. Nelson Publishing Co., 1989. Text. Provides ideas for Modes and Mechanisms.	101		
LRDC	*I-Car Unibody Collision Repair.* Michael McDermott. Delmar Publishers, 1992. Instructor's Guide. See Support Learning Resources for annotation and module correlation.			
LRDC	*Modern Automotive Technology.* James E. Duffy. Irwin Publishing, 1994. Instructor's Guide and Teacher's Resource Binder. See Support Learning Resources for annotation and module correlation.			
LRDC	*Mechanisms: Modular Courses in Technology.* Amay Bailey, Roy Pickup, Ray Lewis and Peter Patient. Oliver and Boyd, 1981. An introductory resource for levers, pulleys, gears, cams, couplings, shafts, bearings and steering.	101 104 113 115		
LRDC	*Motor Auto Body Repair.* Robert Scharff. Delmar Publishers, 1992. Instructor's Guide. See Basic Learning Resources for annotation and module correlation.			
LRDC	*Small Gas Engines.* Alfred Roth. Goodheart-Willcox Co. Inc., 1992. Instructor's Guide. See Support Learning Resources for annotation and module correlation.			
LRDC	*Today's Technician: Manual Transmissions and Transaxles.* Jack Erjavec. Delmar Publishers, 1994. Shop Manual and Classroom Manual. Shop Manual provides introductory and service information on standard transmissions and transaxles. Classroom Manual provides principles of operation and step-by-step approach for diagnosing and repairing manual transmissions and transaxles.	113	213 214	314

MECHANICS RESOURCES

THEME CODE:
A. Vehicle Design & Ownership
B. Energy & Propulstion Systems
C. Control & Transmission Systems
D. Material & Structural Systems
E. Project & Service Work

FORMAT CODE:
P - Print
V - Video
S - Software

STATUS CODE:
B - Basic
S - Support
T - Teaching

LEVEL CODE:
1 - Introductory
2 - Intermediate
3 - Advanced

JR/SR HIGH CODE:
J - Junior
S - Senior

	Format	Status	Junior/Senior High	Modes & Mechanisms	Vehicle Care	Engine Fundamentals	Electrical Fundamentals	Pneumatic & Hydraulic Systems	Mechanical Systems	Ride & Control Systms	Vehicle Structures & Materials	Metal Forming and Finishing	Surface Preparation I	Vehicle Detailing	Vehicle Maintenance	Lubrication & Cooling System	Fuel & Exhaust Systems	Alternate Fuel Engines	Ignition Systems	Emission Controls	Electrical Components	Power Assist Accessories	Braking Systems	Hydraulic Accessories	Power Trains	Manual Transmissions	Suspension Systems	Steering Systems	Metal Repair & Finishing	Trim Removal & Installation	Surface Preparation II	Refinishing I	Basic Touch-up & Finishing	Interior Finishes and Repairs	Buying & Selling a Vehicle	Vehicle Value Appraisal	Engine Performamnce Diagnosis	Engine Tune-up	Engine Removal & Installaion	Engine Reconditioning I	Engine Reconditioning II	Alternate Propulsion Systems	Computer Managment Systems	Safety Systems	Climate Control	Power Assisting	Automatic Transmissions	Power Train Repair	Wheel Alignment	Body Repair Estimation	Structural Damage Analysis	Structural Damage Repair I	Structural Damage Repair II	Refinishing II	Plastic & Fibreglass	Glass Removal & Installation
LEVEL				1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
THEMES				A	A	B	C	C	C	D	D	D	D	A	A	B	B	B	B	C	C	C	C	C	C	C	D	D	D	D	D	D	D	A	A	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D
				101	102	104	109	111	113	115	116	117	119	201	202	203	204	205	206	207	209	210	211	212	213	214	215	216	217	218	219	220	221	222	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322
Auto Body Repair and Finishing - Text	P	B	J/S				X				X	X	X														X	X	X	X	X	X		X																				X		X	
Auto Electricity, Electronics, Computers							X												X		X															X	X				X	X	X	X											
Text	P	S	S																																																					
Student Workbook	P	S	S																																																			
Instructor's Guide	P	T	S																																																		
Auto Engines - Text	P	S	S			X	X								X	X	X	X		X	X																X	X	X	X	X															
Student Workbook	P	S	S																																																			
Instructor's Guide	P	T	S																																																		
Auto Fuel and Emission Control System - Text	P	S	S														X			X																X	X																	
Instructor's Manual	P	T	S																																																		
Auto Shop Safety	V	S	J/S		X	X	X	X	X																																													
Automatic Transmissions															X																																	X										
Text	P	S	S																																																				
Lab Manual	P	S	S																																																		
Instructor's Manual	P	T	S																																																		
Automotive Air Conditioning and Heating - Text	P	S	S												X																																X										
Lab Manual	P	S	S																																																			
Instructor's Manual	P	T	S																																																		

MECHANICS RESOURCES

THEME CODE:
A. Vehicle Design & Ownership
B. Energy & Propulstion Systems
C. Control & Transmission Systems
D. Material & Structural Systems
E. Project & Service Work

FORMAT CODE:
P - Print
V - Video
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STATUS CODE:
B - Basic
S - Support
T - Teaching

LEVEL CODE:
1 - Introductory
2 - Intermediate
3 - Advanced

JR/SR HIGH CODE:
J - Junior
S - Senior

	Format	Status	Junior/Senior High	101 Modes & Mechanisms	102 Vehicle Care	104 Engine Fundamentals	109 Electrical Fundamentals	111 Pneumatic & Hydraulic Systems	113 Mechanical Systems	115 Ride & Control Systms	116 Vehicle Structures & Materials	117 Metal Forming and Finishing	119 Surface Preparation I	201 Vehicle Detailing	202 Vehicle Maintenance	203 Lubrication & Cooling System	204 Fuel & Exhaust Systems	205 Alternate Fuel Engines	206 Ignition Systems	207 Emission Controls	209 Electrical Components	210 Power Assist Accessories	211 Braking Systems	212 Hydraulic Accessories	213 Power Trains	214 Manual Transmissions	215 Suspension Systems	216 Steering Systems	217 Metal Repair & Finishing	218 Trim Removal & Installation	219 Surface Preparation II	220 Refinishing I	221 Basic Touch-up & Finishing	222 Interior Finishes and Repairs	301 Buying & Selling a Vehicle	302 Vehicle Value Appraisal	303 Engine Performance Diagnosis	304 Engine Tune-up	305 Engine Removal & Installation	306 Engine Reconditioning I	307 Engine Reconditioning II	308 Alternate Propulsion Systems	309 Computer Managment Systems	310 Safety Systems	311 Climate Control	312 Power Assisting	313 Automatic Transmissions	314 Power Train Repair	315 Wheel Alignment	316 Body Repair Estimation	317 Structural Damage Analysis	318 Structural Damage Repair I	319 Structural Damage Repair II	320 Refinishing II	321 Plastic & Fibreglass	322 Glass Removal & Installation
LEVEL				1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
THEMES				A	A	B	C	C	C	D	D	D	D	A	A	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	A	A	B	B	B	B	B	B	C	C	C	C	C	C	C	D	D	D	D	D	D	D
Automotive Technology - A Systems Approach - Text	P	S	S		X	X	X	X	X	X					X	X	X			X	X	X	X	X	X	X	X								X	X	X	X	X	X		X	X	X	X	X	X	X					
Tech Manual	P	S	J/S																																																			
Instructor's Guide	P	T	J/S																																																		
Car Care Book, The - Text	P	B	J/S		X	X	X	X	X	X					X																			X	X																	
Instructor's Guide	P	T	J/S																																																	
Complete Automotive Welding Metals and Plastics																													X																									
Text	P	S	S																																																		
Student Tech Shop Manual	P	S	S																																																	
Instructor's Guide	P	T	S																																																	
Complete Engine Performance and Diagnostic - Text	P	S	S													X	X		X	X	X															X	X																
Student Tech Shop Manual	P	S	S																																																	
Instructor's Guide	P	T	S																																																	
Complete Under Car Systems - Steering and Suspension - Text	P	S	S							X											X		X			X	X																									
Technician Shop Manual	P	S	S																																																	
Instructor's Guide	P	T	S																																																	
Design and Technology - Text	P	T	J	X																																																
Engineering Technology: Hydraulics and Pneumatics, Part I and Part II (IBM Ver.)	S	S	J/S					X																																												

MECHANICS RESOURCES

THEME CODE:
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	Format	Status	Junior/Senior High	Modes & Mechanisms	Vehicle Care	Engine Fundamentals	Electrical Fundamentals	Pneumatic & Hydraulic Systems	Mechanical Systems	Ride & Control Systms	Vehicle Structures & Materials	Metal Forming and Finishing	Surface Preparation I	Vehicle Detailing	Vehicle Maintenance	Lubrication & Cooling System	Fuel & Exhaust Systems	Alternate Fuel Engines	Ignition Systems	Emission Controls	Electrical Components	Power Assist Accessories	Braking Systems	Hydraulic Accessories	Power Trains	Manual Transmissions	Suspension Systems	Steering Systems	Metal Repair & Finishing	Trim Removal & Installation	Surface Preparation II	Refinishing I	Basic Touch-up & Finishing	Interior Finishes and Repairs	Buying & Selling a Vehicle	Vehicle Value Appraisal	Engine Performance Diagnosis	Engine Tune-up	Engine Removal & Installation	Engine Reconditioning I	Engine Reconditioning II	Alternate Propulsion Systems	Computer Managment Systems	Safety Systems	Climate Control	Power Assistng	Automatic Transmissions	Power Train Repair	Wheel Alignment	Body Repair Estimation	Structural Damage Analysis	Structural Damage Repair I	Structural Damage Repair II	Refinishing II	Plastic & Fibreglass	Glass Removal & Installation
LEVEL				1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
THEMES				A	A	B	C	C	C	D	D	D	D	A	A	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D	A	A	B	B	B	B	B	C	C	C	C	C	C	D	D	D	D	D	D	D	D
				101	102	104	109	111	113	115	116	117	119	201	202	203	204	205	206	207	209	210	211	212	213	214	215	216	217	218	219	220	221	222	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322
I-Car Unibody Collision Repair											X	X	X															X	X																							X	X	X	X	X	X
Text	P	S	S																																																					
Instructor's Guide	P	T	S																																																			
Modern Automotive Technology - Text	P	B	S	X	X	X	X	X		X					X	X	X		X	X	X	X	X	X	X	X	X					X				X	X	X	X	X		X		X		X	X	X							
Student Workbook	P	S	S																																																			
Instructor's Guide	P	T	J/S																																																		
Teacher's Resource Binder	P	T	J/S																																																		
Modular Courses in Technology - Mechanisms. Text	P	T	J/S	X		X			X	X																																													
Motor Auto Body Repair	P	B	S								X	X	X																X	X	X	X	X																	X	X	X	X	X	X	X
Instructor's Guide	P	T	S																																																			
Small Gas Engines - Text	P	S	J/S			X										X	X		X																																				
Workbook	P	S	J/S																																																			
Instructor's Guide	P	T	J/S																																																			
Today's Technician: A Manual Transmissions and Transaxles									X															X	X																							X							
Classroom Manual	P	T	S																																																			
Shop Manual	P	T	S																																																		

OTHER RESOURCES

These titles are provided as a service only to assist local jurisdictions to identify resources that contain potentially useful ideas for teachers. Alberta Education has done a preliminary review of the resources. However, the responsibility to evaluate these resources prior to selection rests with the user, in accordance with any existing local policy.

Distributor Code	Other Resources
AECD	*Apprenticeship Training: Agriculture Mechanic Program.* Edmonton, AB: Alberta Advanced Education and Career Development, Apprenticeship and Industry Training. Curriculum outline. Describes the parameters/course requirements for apprenticeship in the Agriculture Mechanic trade.
AECD	*Apprenticeship Training: Auto Body Technician Program.* Edmonton, AB: Alberta Advanced Education and Career Development, Apprenticeship and Industry Training. Curriculum outline. Describes the parameters/course requirements for apprenticeship in the Auto Body Technician trade.
AECD	*Apprenticeship Training: Automotive Service Technician Program.* Edmonton, AB: Alberta Advanced Education and Career Development, Apprenticeship and Industry Training. Curriculum outline. Describes the parameters/course requirements for apprenticeship in the Automotive Service Technician trade.
AECD	*Apprenticeship Training: Heavy Duty Technician Program.* Edmonton, AB: Alberta Advanced Education and Career Development, Apprenticeship and Industry Training. Curriculum outline. Describes the parameters/course requirements for apprenticeship in the Heavy Duty Technician trade.
AECD	*Apprenticeship Training: Motorcycle Mechanic Program.* Edmonton, AB: Alberta Advanced Education and Career Development, Apprenticeship and Industry Training. Curriculum outline. Describes the parameters/course requirements for apprenticeship in the Motorcycle Mechanic trade.
ACC	*Car Owner's Maintenance Guide, A.* Edmonton, AB: ACCESS: The Education Station. Print.
PAB	*Highway Traffic Act.* Edmonton, AB: Queen's Printer. Includes Inspection of Write-off Vehicles.

Other Resources (continued)

Distributor Code	Other Resources
ACC	How the Motor Car Works (series). Edmonton, AB: ACCESS: The Education Station. Video. • *The Engine* • *Engine Lubrication* • *The Carburator.*
PAB	*Motor Transportation Act.* Edmonton, AB: Queen's Printer. Includes Public Vehicles, general equipment and safety regulations. Commercial Vehicle Maintenance Standards.
PAB	*Occupational Heath and Safety Act.* Edmonton, AB: Queen's Printer. Provides current information on health and safety as it pertains to the workplace.

ADDITIONAL SOURCES

Available to Mechanics teachers, both locally and provincially, are many sources that can be used to enhance the Mechanics strand. These sources are available through the community, government agencies, resource centres and organizations such as motor vehicle manufacturers and equipment manufacturers that have user manuals that contain valuable information for Mechanics programs. Some of these sources, e.g., government departments, undergo frequent name and/or telephone number changes. Please check your telephone directory or an appropriate government directory.

The following is a partial list of sources to consider.

TEACHER-LIBRARIANS

Planned and purposeful use of library resources helps students grow in their ability to gather, process and share information. Research activities require access to an adequate quantity and variety of appropriate, up-to-date print and non-print resources from the school library, other libraries, the community and additional sources. Some techniques to consider are:

- planning together
- establishing specific objectives
- integrating research skills into planning.

Cooperation between the teacher-librarian and the subject area teacher in the development of effectively planned resource-based research activities ensures that students are taught the research skills as well as the subject content.

Also see *Focus on Research: A Guide to Developing Student's Research Skills* referenced in the Alberta Education Resources section.

ALBERTA EDUCATION SOURCES

The following monographs are available for purchase from:

Learning Resource Distributing Centre
12360 – 142 Street
Edmonton, AB
T5L 4X9
Telephone: 427–2767
Fax: 422–9750

Please consult the "Support Documents" section or the "Legal, Service and Information Publications" section in the *Buyers Guide* for ordering information and costs.

Developmental Framework Documents

- *The Emerging Student: Relationships Among the Cognitive, Social and Physical Domains of Development*, 1991

  This document looks at the whole child, or student, as a productive learner, integrating all the domains of development: cognitive, social and physical. It emphasizes the need for providing balanced curriculum and instruction.

- *Students' Interactions Developmental Framework: The Social Sphere*, 1988

  This document focuses on the student as a social being. It looks at the student's affective or emotional growth and examines moral development. These three domains make up the social sphere.

- *Students' Physical Growth: Developmental Framework Physical Dimension*, 1988

  This document examines children's normal physical growth in three areas: perceptual, structural and motor development. In none of these areas is the child's growth in a single continuous curve throughout the first two decades of life. Physical growth is characterized by periods of rapid growth and, periods of slower growth. Consequently differences and changes in growth patterns may affect the timing of certain learning processes.

- *Students' Thinking: Developmental Framework Cognitive Domain*, 1987

  This document explores children's cognitive development from infancy to adolescence. The Piagetian stages of pre-operational, concrete operational and formal operational thinking are explained. Suggestions for improving the learning process are also presented.

Others

- *Focus on Research: A Guide to Developing Students' Research Skills*, 1990

  This document outlines a resource-based research model that helps students manage information efficiently and effectively, and in this process, to gain skills that are transferable to all school and work situations. This model provides a developmental approach to teaching students how to do research.

- *Teaching Thinking: Enhancing Learning*, 1990

  Principles and guidelines for cultivating thinking, ECS to Grade 12, have been developed in this resource. It offers a definition of thinking, describes nine basic principles on which the suggested practices are based, and discusses possible procedures for implementation in schools and classrooms.

OTHER GOVERNMENT SOURCES

ACCESS: The Education Station

ACCESS: The Education Station offers a variety of resource and services to teachers. For a nominal dubbing and tape fee, teachers may have ACCESS: The Education Station audio and video library tapes copied.
ACCESS: The Education Station publishes a listing of audio and video cassettes as well as a comprehensive programming schedule.

Of particular interest are the Career and Technology Studies videos that are available with teacher utilization guides. The guides outline key points in each video and suggest questions for discussion, classroom projects and other activities. Video topics are listed in the Support Learning Resources section of this Guide. The videos and accompanying support material can be obtained from:

ACCESS: The Education Station
3720 76 Avenue
Edmonton, AB
T5B 2N6
Telephone: 440–7777 (in Edmonton)
1–800–352–8293 (outside Edmonton)

Alberta Advanced Education and Career Development
Library
Information and Policy Services
9th Floor Commerce Place
10155 – 102 Street
Edmonton, AB
T5J 4L5
Telephone: 422–4752
Fax: 427–0793

Career Information Catalogue Update, 1994
The Career Planner
Children Challenge Choice
Entrepreneur: A Big Word for Small Business
Rural Women as Business Entrepreneurs
Positive Works
Skills are your Passport.

Videos on career planning and entrepreneurial topics are available through the library of this department. Call 422–4752 for more information. The following videos are representative of the library's holdings:
The Entrepreneur
Get a Job
A Head for Business
The Seven Phases of a Job Interview.

Alberta Apprenticeship Program
For more information, contact the Alberta Advanced Education and Career Development office nearest you or call the Alberta Career Information Hotline, 1-800–661–3753 (toll-free), Edmonton 422–4266.

Alberta Economic Development and Tourism
Strategic Planning and Research
9th Floor, Sterling Place
9940 – 106 Street
Edmonton, AB
T5K 2P6
Telephone: 422–9494
Fax: 422–5922

Financing a Small Business
Marketing a Small Business
Starting a Small Business.

Alberta Environmental Protection
Education Branch
12th Floor, 9820 – 106 Street
Edmonton, AB
T5K 2J6
Telephone: 427–6310
Fax: 427–2512

(Workshops and presentations can be arranged.)

Alberta Environmental Protection
Land and Forest Services
9920 – 108 Street
10th Floor, Bramalea Building
Edmonton, AB
T5K 2M4
Telephone: 427–3551
Fax: 427–0292

Alberta Health
Environmental Health Services
10030 – 107 Street
Edmonton, AB
T5J 3E4
Telephone: 427–2643

Alberta Labour
9940 – 106 Street
Edmonton, AB
T5K 2N2
Telephone: 427–8848

Offices are also in Calgary, Camrose, Edson, Fort McMurray, Grande Prairie, Lethbridge, Medicine Hat, Red Deer and Vermillion.

Environment Canada
Inquiry Centre
10 Wellington Street, 1st Floor
Hull, Quebec
K1A 0H3
Telephone: (819) 997–2800
Fax: (613) 953–2225

Environmental Council of Alberta
400, 9925 – 109 Street
Edmonton, AB
T5K 2J8
Telephone: 427–5792
Fax: 427–0388

Industry and Science Canada
Consumer Affairs
10225 – 100 Avenue
Edmonton, AB
T5J 0A1
Telephone: 495–2485
Fax: 495–6451

or

301, 510 – 12 Avenue SW
Calgary, AB
T2R 0H3
Telephone: 292–5604
Fax: 2 92–6175

National Film Board of Canada (NFB)
The NFB has numerous films and videotapes that may be suitable for Mechanics. For a listing of NFB films and videotapes indexed by title, subject and director, or for rental or purchase of NFB films and videotapes, call 1–800–267–7710 (toll-free).

Educational Marketing Officers in Calgary and Edmonton are available, province wide, for workshops, conferences, professional development days and similar activities. For northern Alberta and the Northwest Territories, the Educational Marketing Officer can be reached at 495–3012 (fax, 495–6412). For southern Alberta, contact the Educational Marketing Officer at 292–5411 (fax, 292–5458).

ACCESS: The Education Station and some school boards have acquired duplication rights to some NFB videotapes. Please consult the relevant catalogues in your school or school district.

The Calgary Public Library has a selection of NFB films and videotapes that can be borrowed free of charge with a Calgary Public Library borrower's card. For further information, contact:

Calgary Public Library
Films and Recordings Department
616 Macleod Trail SE
Calgary, AB
T2G 2M2
Telephone: 260–2781
Fax: 292–5458

Resource Centres

Urban Resource Centres

Calgary Board of Education
Supervisor, Education Media
3610 – 9 Street SE
Calgary, AB
T2G 3C5
Telephone: 294–8540
Fax:: 287–9739

Calgary Separate School Board
Supervisor, Instructional Materials
6220 Lakeview Drive SW
Calgary, AB
T3E 5T1
Telephone: 246–6663
Fax: 249–3054

County of Strathcona
Director, Learning Resource Service
2001 Sherwood Drive
Sherwood Park, AB
T8A 3W7

Edmonton Public School Board
Learning Resource Consultant
Centre for Education
One Kingsway Avenue
Edmonton, AB
T5H 4G9
Telephone: 429–8320
Fax: 429–8318

Lakeland School District No. 5460
Area Superintendent
Postal Bag 1001
6005 – 50 Avenue
Bonnyville, AB
T9N 2L4
Telephone: 826–3145
Fax: 826–4600

Medicine Hat School District No. 76
IMC Manager
601 – 1 Avenue SW
Medicine Hat, AB
T1A 4Y7
Telephone: 526–1323
Fax: 529–5339

Red Deer Public School Board
Coordinator of Instruction
4747 – 53 Street
Red Deer, AB
T4N 2E6
Telephone: 343–1405
Fax: 347–8190

St. Anthony's Teacher Centre
Supervisor, Curricular Resources
10425 – 84 Avenue
Edmonton, AB
T6E 2H3
Telephone: 439–7356
Fax: 433–0181

Regional Resource Centres

Zone I

Zone I Regional Resource Centre
Film Supervisor
10020 – 101 Street
P.O. Box 6536
Peace River, AB
T8S 1S3
Telephone: 624–3187
Fax: 624–5941

Zone II and III

Central Alberta Media Services (CAMS)
Film Supervisor
182 Sioux Road
Sherwood Park, AB
T8A 3K5
Telephone: 464–5540
Fax: 467–5469

Zone IV

Alberta Central Regional Education Services (ACRES)
Operations Manager
Box 1000
Parkland Regional Library Building
5404 – 56 Avenue
Lacombe, AB
T0C 1S0
Telephone: 782–3850
Fax: 782–4650

Zone V
South Central Alberta Resource Centre
(SCARC)
c/o Golden Hills Regional Division
435 A Hwy #1
Strathmore, AB
T1P 1J4
Telephone: 934–5028
Fax: 934–5125

Zone VI
Southern Alberta Learning Resource Centre
(SALRC)
Film Supervisor
Provincial Government Administration
Building
120, 909 Third Avenue North
Box 845
Lethbridge, AB
T1J 3Z8
Telephone: 320–7807
Fax: 320–7817

Statistics Canada
Regional Office
8th Floor, Park Square
10001 Bellamy Hill
Edmonton, AB
T5J 3B6
Telephone: 495–3023
Fax: 495–5318

PROFESSIONAL ASSOCIATIONS

Alberta Teachers' Association
Specialist Council
(Alberta Teachers' Association)
Barnett House
11010 – 142 Street
Edmonton, AB
T5N 2R1

INDUSTRY ORGANIZATIONS

Alberta Motor Association
10310 – 39A Avenue
Box 8180 St. South
Edmonton, AB
T6H 5X9
Telephone: (403) 430–5521

Alberta Special Waste Management Corp.
610, 10909 Jasper Avenue
Edmonton, AB
T5J 3L9
Telephone: 422–5029 or
1–800–272–8873
Fax: 428–9627

Motor Dealer Association of Alberta
9249 – 48 Street
Edmonton, AB
T6B 2R9
Telephone: (403) 468–9552

MOTOR VEHICLE MANUFACTURERS REGIONAL OFFICES

Chrysler Canada Limited
200, 10201 Southport Road SW
Calgary, AB
T2W 4X9
Telephone: 299–2900

Ford Motor Company of Canada Limited
11604 – 181 Street
Edmonton, AB
Telephone: 454–9621

General Motors of Canada
4220 Blackfoot Trail SE
Calgary, AB
Telephone: 531–5500

Honda Canada Inc.
13240 Worster Court
Richmond, BC
V6V 2B8
Telephone: (604) 278–7121

Mazda Canada Inc.
400, 2075 Kennedy Road
Scarborough, ON
M1T 3V3
Telephone: 1–800–263–4680

Nissan Canada Inc.
Box 2501
New Westminster, BC
V3L 5A1
Telephone: (604) 526–4581

Toyota Canada Inc.
5330 Skyline Way NE
Calgary, AB
T2E 6V1
Telephone: 295–1055

ENVIRONMENTAL FACILITIES

The following is a partial list of facilities that provide hands-on experience for students in aspects of resource management and environmental education. Contact should be made directly with the facility to obtain details of what is offered to school groups or students.

Energeum
(Energy Resources Conservation Board)
640 – 5 Avenue SW
Calgary, AB
T2P 3G4
Telephone: 297–4293

Environmental Resource Centre
10511 Saskatchewan Drive
Edmonton, AB
T6E 4S1
Telephone: 433–4808

OTHER AGENCIES

Canadian Foundation for Economic Education
501, 2 St. Clair Avenue West
Toronto, ON
M4V 1L5
Telephone: (416) 968–2236
Fax: (416) 968–0488

Entrepreneurship: A Primer for Canadians (teacher resource)
Labour Market: Teacher's Resource Package (teacher resource)
Money and Youth
Women in the Work Force.

The Conference Board of Canada
255 Smyth Road
Ottawa, ON
K1H 8M7
Telephone: (613) 526–3280
Fax: (613) 526–4857

Economic Forecast: Provincial Outlook (research reports, personalized information services).

FEESA
320, 9939 Jasper Avenue
Edmonton, AB
T5J 2X5
Telephone: 421–1497
Fax: 425–4506

FEESA offers education training and resource materials focusing on a variety of environmental and educational needs. Programs are developed in partnership with business, industry, government, environmental and education groups.

Junior Achievement of Northern Alberta
22, 10210 – 117 Street
Edmonton, AB
T5K 1X6
Telephone: 482–7521
Fax: 488–5924

Junior Achievement of Southern Alberta
739 – 10 Avenue SW
Calgary, AB
T2R 0B3
Telephone: 263–2545
Fax: 261–6988

Materials are available only where Junior Achievement has identified community business consultants and provided inservice.

DISTRIBUTOR DIRECTORY

The entries in the distributor directory are arranged alphabetically by code.

Code	Distributor/Address	Telephone/Fax
ACC	ACCESS: The Education Station 3720 – 76 Avenue Edmonton, AB T5B 2N6	(403)440–7777 1–800–352–8293 Fax: (403) 440–8899
AECD	Alberta Advanced Education and Career Development 10th Floor, Commerce Place 10155 – 102 Street Edmonton, AB T5H 4L5	(403) 427–8765
LRDC	Learning Resources Distributing Centre 12360 – 142 Street Edmonton, AB T5L 4X9	(403) 427–2767 Fax: (403) 422–9750
PAB	Queen's Printer Public Affairs Bureau 2nd Floor 11510 Kingsway Avenue Edmonton, AB T5G 2Y5	(403) 427–4952

MECHANICS

SECTION J: SAMPLE STUDENT LEARNING GUIDES

(INTERIM, 1996)

TABLE OF CONTENTS

A student learning guide presents information and direction to help students attain the expectations defined in a specified CTS module. It is designed to be used by students under the direction of a teacher.

The student learning guides included in this section are organized as follows:

- Why take this module?
- What do you need to know before you start?
- What will you know and be able to do when you finish?
- When should your work be done?
- How will your mark for this module be determined?
- Which resources may you use?
- Activities/Worksheets

A student learning guide is <u>not</u> a self-contained learning package (e.g., Distance Learning Module), such as you might receive from the Alberta Distance Learning Centre (ADLC) or Distance Learning Options South (DLOS).

SAMPLE STUDENT LEARNING GUIDES

Modes and Mechanisms (MEC101) J.1

Vehicle Detailing (MEC201) J.7

Modes and Mechanisms (MEC101)

TAKE THIS MODULE?

- to learn and apply the design process
- to be creative and build a model of a transport vehicle
- to apply marketing and advertising skills during your sales campaign
- to learn about aerodynamics in all types of vehicles
- to test and evaluate your vehicle
- to use and compile a portfolio

DO YOU NEED TO KNOW BEFORE YOU START?

- No previous experience is required for this module but understanding the design process is an asset.
- To be successful you must be able to:
  - - follow safe lab procedures and safety regulations
  - - work cooperatively with others.

Modes and Mechanisms (MEC101)

WILL YOU KNOW AND BE ABLE TO DO WHEN YOU FINISH?

On completion of this unit you should be able to:

- use basic hand and power tools in a safe manner
- sketch and use conventional drafting equipment or a CAD program
- use the design process to construct and create projects
- apply the laws of motion
- calculate and compare the performance of a vehicle
- evaluate your project

SHOULD YOUR WORK BE DONE?

- You will have 25 hours to complete this unit. Approximately 8 hours of that time may be spent on demonstrations, lectures and the safe operation of tools and machines,

Modes and Mechanisms (MEC101)

WILL YOUR MARK FOR THIS MODULE BE DETERMINED?

	PERCENTAGE
You must first demonstrate **all** of the competencies required for this module. When you have done this, your percentage mark for the module will be determined as follows:	
• Research of a particular vehicle	10%
• Sketches and working drawing	20%
• Advertising campaign posters	10%
• Vehicle construction and performance	40%
• Safe use of tools and machines	10%
• Evaluation (self & teacher)	10%

RESOURCES MAY YOU USE?

- Technology Learning Wheel (1) Aerodynamics (2) Solar (3) Wind (4) Aerospace (5) Mag. Lev.
- Hacker, *Living with Technology*
- Browning, *Design and Technology*
- Gradwell, *Technology Shaping Our World*
- Science Directions 7 (Unit 3) 8 (Unit 2) & 9 (Unit 4)

Modes and Mechanisms (MEC101)

ACTIVITIES/WORKSHEETS

STATEMENT OF A PROBLEM: Following the Design/Problem-Solving Process you will design and construct a model of a transportation vehicle using a simple power source, common materials and tools.

You will show marketing skills by designing a poster that promotes your vehicle.

RESEARCH: Using your science textbooks and the references provided, complete the following in your portfolio:

1. Describe the forces that are to be overcome when a vehicle moves:
   - on land
   - in water
   - in air
   - in space.

2. Determine what techniques can be used to:
   - start and stop a vehicle
   - speed up and slow down a vehicle
   - control the direction of a vehicle
   - give a vehicle stability.

3. Demonstrate and/or describe how energy can be used to produce motion in a:
   - spring
   - elastic
   - $C0_2$ capsule
   - electro-magnetic device.

ALTERNATIVE SOLUTIONS: Brainstorm and sketch three thumbnail drawings of your transportation vehicle and place into your portfolio.
Note: Remember your vehicle could be a land, air or water vehicle.

FINAL SOLUTION: Use drawing instruments to produce an orthographic drawing that shows the top and side of your concept vehicle. Place this drawing in your portfolio.

CONSTRUCTION: Choose the appropriate materials to construct a prototype by considering their:
   - workability
   - strength
   - weight
   - cost.

Safely construct the vehicle according to the specifications and working drawings.
Apply a finish to the vehicle to:
   - enhance its appearance
   - increase its performance
   - increase its longevity.

Modes and Mechanisms (MEC101)

EVALUATION: Test the vehicle individually or in competition with others in relation to:
- its speed in metres per second
(Speed = $\frac{\text{Distance}}{\text{Time}}$)
- load in grams.

PRESENTATION: During construction there may be some down time owing to the absence of machinery. You may design your advertising and marketing poster, which will be used for the final presentation of your transportation vehicle. The poster will be designed by you but it must include the following information:

1. The name of your vehicle
2. A colour drawing of the vehicle
3. Promotional information and any relevant data.

BE CREATIVE

CSB: 96 06 07

Vehicle Detailing (MEC201)

TAKE THIS MODULE?

- Today's modern vehicles reflect the many different attitudes and values of their owners. Through colour and graphic enhancement owners are able to express their personal satisfaction and pride in their vehicle. In this module, you will experience and become knowledgeable in the methods used to enhance exterior surfaces and engine compartments.

DO YOU NEED TO KNOW BEFORE YOU START?

- No previous experience is required for this module.
- Use basic hand tools and power drills in a safe manner
- Follow instructions as given by product manufacturers
- Work patiently and use time effectively.

Vehicle Detailing (MEC201)

WILL YOU KNOW AND BE ABLE TO DO WHEN YOU FINISH?

- List hazardous cleaning products and precautions for their use
- Describe several methods of altering and enhancing exterior appearances and identify correct methods used for each
- Demonstrate the correct methods for applying waxes, cleaners and trim paints
- Identify common trim fasteners and the procedures for removal and installation of trim
- Successfully apply pin striping and/or decals to a vehicle
- Show knowledge of the value of vehicle enhancement and possible career opportunities.

SHOULD YOUR WORK BE DONE?

Vehicle Detailing (MEC201)

WILL YOUR MARK FOR THIS MODULE BE DETERMINED?

	PERCENTAGE
You must first demonstrate **all** of the competencies required for this module. When you have done this, your percentage mark for the module will be determined as follows:	
• Safe use of materials and tools	10%
• Identification of products best suited for the work to be done	10%
• Knowledge of trim options and methods of application and fastening	10%
• Project completion: exterior clean and wax, trim repair, installation, engine beautification.	70%

RESOURCES MAY YOU USE?

- Basic set of hand tools, hand drill and bits and specialty trim removal tools as required
- Trim products: pin striping, decals, molding, spray paint and any student-purchased accessory to be installed
- Assortment of degreasers, cleaners, waxes and related application products and tools
- Engine spray paint and miscellaneous hardware (as required).

Vehicle Detailing (MEC201)

Activity 1

Challenge: Identify painted and trim surface flaws and follow methods described by product manufacturer to correct and enhance the appearance using degreasers, waxes and possibly trim paint.

Limitations: Vehicles must be in reasonably good shape, where products used will be effective in meeting the expectations.

Expectations:

- A complete vehicle cleaning, using suitable products and procedures. This is to be followed by minor surface flaw corrections, e.g., light sanding or touch-up with spot paint.
- Wax and polish surfaces using methods described by product manufacturers. Include chrome, rubber, vinyl and other trim.
- Glass cleaning using appropriate product.

Resources: Catalogues from local auto supply stores, e.g., Canadian Tire, UAP
Service/product manual from Meguiars product line.

Activity 2

Challenge: Remove and/or replace trim parts using appropriate tools and methods. This may include installation of a new trim part and an examination of 3 or 4 methods of fastening trim (e.g., clips, 2-way tape, blind nuts, etc.).

Limitations: Vehicle type or budget in the case of new trim parts.

Expectations:

- Use appropriate tools to remove window and side trim as applicable and replace.
- Install an accessory trim part such as side molding, mud flaps, running boards or other as desired.
- Apply pin striping and/or decaling to enhance the appearance of the vehicle. Repeat.

Resources:

- Auto supply dealers and supply catalogs
- *Autobody Repair and Refinishing*, Hogg (1988) Fasteners
- Product installation manuals when available.

Vehicle Detailing (MEC201)

Activity 3

Challenge: To clean and paint, for visual enhancement, the engine compartment of a vehicle.

Limitations: Vehicle should be in need of work where the end product is indeed enhancing and visually rewarding.

Expectations:

- Safely use degreaser and cleaners to clean the engine compartment, avoiding damage to electrical and other related systems.
- Follow safety instructions provided in repainting of the engine and adjacent surfaces to produce a like-new appearance, and generally clean-up the area by grouping or realigning wires and hoses.
- Service the hinges, latch and hood anti-vibration bumpers.
- Optional: Install owner-purchased accessories used for visual enhancement, e.g., chrome or wire/hose coverings.
- Service battery terminals and battery.

Resources:

- Auto service manual, engine cleaning
- Peterson publication(s) Engine Beautification

Other Suggested Activities

1. Visit two local auto accessory stores to examine the cost of parts desired and their availability.

2. Visit a local auto dismantler to examine variations in trim, design and fastening. Also examine the value in used parts that are available. Remove and purchase desired trim or parts required for a repair.

3. Career exploration: Visit a professional trim application service centre or arrange for a professional trim applicator to visit the class.

Alberta
EDUCATION

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